VPA PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the VPA permit listed below. This permit authorizes the land application of municipal effluent from a 0.035 MGD package treatment facility at the Mountain Lake Hotel.

1. **Name and Address:**

Facility Name and Address:
Mountain Lake Hotel WWTP
115 Hotel Circle
Pembroke, VA 24136
Location: Giles County (7 miles northeast of Pembroke)

Legal Name of Owner and Address:
Mary Moody Northen Endowment
2628 Broadway Street
Galveston, TX 77550

2. **Permit No.: VPA02058**
Current Permit Expiration Date: June 18, 2012

3. **SIC Codes:** 4952, 7011

4. **Facility/ Operator Contacts:**
H.M. Scanland, Jr., General Manager, 540-626-7121, bscanland@mountainlakehotel.com
Ron Smith, Class III Wastewater Operator, 540-626-5371

5. **Permit Application Information:**

Application Submitted By:	Betty Massey, Executive Director, Mary Moody Northen Endowment
Address:	2628 Broadway Street, Galveston, TX 77550
Application Receipt Date:	August 11, 2011
Additional Information Requested:	September 29, 2011, 2/28/12
Additional Information Received:	February 14, 2012, 3/1/12, 3/8/12, 3/9/12
Application Complete Date:	March 8, 2012 (without public notice authorization) Public Notice Authorization Received 4/6/12

6. **Permit Processing Information:**

DEQ Regional Office:	Blue Ridge Regional Office
Site Inspection Performed By:	Becky L. France, Water Permit Writer
Date of Site Inspection:	July 29, 2011
Permit Drafted By:	Becky L. France, Water Permit Writer
Date Permit Drafted:	March 15, 2012, (Revised 4/11/12, 4/18/12)
Draft Permit Reviewed By:	Kevin Crider, Water Permit Writer
Signature of Reviewer:	
Date Draft Permit Reviewed:	March 22, 2012 April 20, 2012
Public Notice Comment Period:	4/19/12 to 5/18/12

7. **Permit Characterization:**

Permit Action	Facility	Permit Type
☐ Issuance	☒ Existing facility	☐ Biosolids distribution, marketing, storage, and land application
☒ Reissuance	☐ Proposed facility	☐ Frequent
☐ Revocation and reissuance	☒ Municipal	☐ Infrequent
☐ Owner modification	☐ POTW	☐ Land application/storage of animal waste
☐ Board initiated modification	☒ PVOTW	☒ Land application of wastewater
☐ Interim authorization	☐ Private	☐ Industrial
☐ Enforcement action	☐ Federal	☒ Municipal
☐ Change of name/ownership	☐ State	☐ Land application of industrial sludge
	☐ Industrial	☐ Land application of water plant residuals
	☐ Privately owned	☐ Land application of septage
	☐ Publicly owned	☐ Water reclamation and reuse
	☐ Animal feeding operation/poultry waste management	☐ Pump and haul
		☐ Other: _____

8. **Annual Permit Maintenance Fee per 9 VAC 25-20-142:**

$1,350 – VPA Municipal Wastewater Operation (2012- Subject to Annual Adjustments)

9. **Licensed Operator Requirements:** Class III

10. **Reliability Class:** I

11. **Pollution Management Activity Description:**

The permitted activity consists of land application of municipal sewage effluent from a 35,000 gallon package treatment facility. This facility began operation in 1987. The treatment facilities serve a seasonal resort offering 116 rental rooms, cottages, 17 cottages, a 125-seat dining room, and conference

and recreational facilities. The treatment works consists of bar screen, communitor, equalization basin, aeration basin, clarifier, and tablet chlorinator. Sludge is stored in a sludge holding tank and periodically hauled to the Peppers Ferry Regional Wastewater Treatment Plant. Effluent from the package treatment system is stored in a 3 million gallon tank and land applied during the months of June, July, and August. The land application site consists of 16 forested acres subdivided into one-acre plots spray irrigated at a controlled rate. Twelve of the plots are currently being used for spray irrigation. See **Attachment A** for a treatment system diagram and a copy of the site inspection report.

Table 1
TREATMENT WORKS DESCRIPTION

Treatment Facility	**Treatment (Unit by Unit)**	**Flow Design (MGD)**
Mountain Lake Hotel WWTP	Bar screen Comminutor Equalization basin (12,000 gallon) Aeration basin Clarifier Sludge holding tank (9,300 gallon) Tablet chlorinator Effluent storage tank (3 million gallon) Spray irrigation system	0.035

12. **Location Description:** The facility is located off 115 Hotel Circle approximately 7 miles northeast of Pembroke, Virginia. See **Attachment A** for a copy of the USGS Topographic Map which indicates the location of the pollution management activity and significant dischargers (potential and actual). The treatment works is located at a latitude and longitude of N 37° 21' 10", E 80° 33' 16".

Name of Topo: Eggleston Number: 112D
River Basin: New River
Watershed: VAW-N24R

13. **Basis for Limits and Monitoring Requirements and Special Conditions:**

This land application system was designed to provide additional nutrient removal beyond the capabilities of the package treatment system. Nitrogen has been identified as the limiting nutrient, and the land application rate set to limit the yearly nitrogen loading to the land application sites. The permit limits and monitoring requirements are based upon the assumption that this system is a land treatment system as defined in 9 VAC 25-790 of the Sewage Collection and Treatment (SCAT) Regulations rather than a supplemental irrigation system as defined in 9 VAC 25-740-100.C.2 of the Water Reclamation and Reuse Regulation.

A. **Part I.A Limits and Monitoring Requirements – Effluent from Treatment Plant**

Flow – The permitted design flow of 0.035 MGD for the package treatment facility is taken from the application for the reissuance. Between November 2008 and January 2012 the maximum flow was 0.098 MGD and the average monthly average flow was 0.031 MGD. See **Attachment C** for a summary of the flow data. In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), flow shall continue to be measured and recorded daily.

BOD_5 – All the BOD_5 data collected from November 2008 through January 2012 were significantly below the 60 mg/L limit. The highest value was 3.0 mg/L. See **Attachment C** for a summary of the BOD_5. The BOD_5 maximum limit of 60 mg/L has been continued from the previous permit. This maximum limit for treatment prior to land application is in accordance with 9 VAC 25-790-880F of the Sewage Collection and Treatment Regulations. Monthly average and weekly average monitoring shall continue at a frequency of 1/month via grab samples.

Total Suspended Solids (TSS) – The maximum data value collected between November 2008 and January 2012 was 5 mg/L. See **Attachment C** for a summary of TSS data. High total suspended solids can clog irrigation equipment. In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), monthly average and weekly average TSS monitoring at a frequency of 1/month via grab samples has been continued from the previous permit. Loadings shall no longer be required.

E. coli – In accordance with the 9 VAC 25-790-880F of the Sewage Collection and Treatment (SCAT) Regulations, a maximum E. coli limit of 18 N/100 mL has been added. The SCAT Regulations specify a fecal coliform limit of 23 N/100 mL for land application sites with a 50 foot buffer zone water sources and channels where there may be public access. This *E. coli* limit is equivalent to fecal limit of 23 N/100 mL specified in 9 VAC 25-790-880F of the SCAT Regulations. The monitoring frequency is 1/month via grab sample.

Total Residual Chlorine (TRC) – All the TRC data from November 2008 through August 2011 complied with the minimum TRC limit of 2.0 mg/L. See **Attachment C** for a summary of the TRC data. This minimum TRC limit of 2.0 mg/L has been continued from the previous permit. This limit is in accordance with 9 VAC 25-790-880 of the Sewage Collection and Treatment Regulations which requires disinfection prior to land application. TRC monitoring shall continue to be monitored 1/day.

pH – All of the pH data from November 2008 through August 2011 complied with the minimum limit of 6.0 S.U. and maximum limit of 9.0 S.U. These pH limits have been continued from the previous permit. These requirements are in accordance with the Ground Water Standards (9 VAC 25-280-10 et seq.). Since the permittee adjusts the alkalinity to optimize treatment and maintain pH, the current monitoring frequency of 1/day provides a check on operational controls and has been continued from the previous permit.

Volume of Storage/ Remaining Storage Capacity – From November 2008 through January 2012 an average excess storage capacity was maintained (**Attachment C**). In accordance with Guidance Memo 94-002 (Regional Directors Authorization to Process VPA Permits for Land Application of Municipal Wastewater), monitoring of the effluent storage tank has been continued at a frequency of 1/day. The monthly average storage volume and minimum remaining storage capacity shall be reported monthly.

B. **Part I.A Limits and Monitoring Requirements – Effluent Storage Tank**

Volume from Storage --The total volume delivered to each site shall be monitored and the gallons/month shall be calculated for each site. These calculations are needed to ensure the hydraulic loading rate is met. The volume to each site is required under Guidance Memo 94-002 (Regional Directors Authorization to Process VPA Permits for Land Application of Municipal Wastewater).

E. coli – E. coli monitoring via grab samples at a rate of 1/month during months of spray irrigation shall replace fecal coliform monitoring. Bacteria monitoring is in accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater) and verifies that irrigation water is not contaminated with high levels of *E. coli* which could pose a potential public health risk.

In accordance with the 9 VAC 25-790-880F of the Sewage Collection and Treatment (SCAT) Regulations, a maximum E. coli limit of 18 N/100 mL has been added. The SCAT Regulations specify a fecal coliform limit of 23 N/100 mL for land application sites with a 50 foot buffer zone water sources and channels where there may be public access. This *E. coli* limit is equivalent to fecal limit of 23 N/100 mL specified in 9 VAC 25-790-880F of the SCAT Regulations.

BOD_5, pH, Total Kjeldahl Nitrogen (TKN), ammonia-N, Nitrate-N, Total Nitrogen – These parameters shall continue once per month during months of spray irrigation. TKN, ammonia-N, nitrate-N, and BOD_5 composite samples shall be collected. Total nitrogen shall be calculated once per month. Monitoring for pH, TKN, ammonia, and nitrate is in accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater) to characterize the wastewater nutrient content prior to land application. Total nitrogen is also required because it is necessary to calculate the nitrogen loading for the spray irrigation sites. Since the effluent is stored during part of the year, BOD_5 is required to monitor the quality of the effluent prior to land application.

Total Phosphorus, Total Potassium – Total phosphorus and total potassium shall continue to be monitored via composite samples. Between May 2005 and August 2011 the maximum total phosphorus value was 0.37 mg/L, and the maximum potassium value was 0.961 mg/L. See **Attachment C** for a summary of these data. Monitoring for these parameters is in accordance

with the Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater). Current Agency Guidance for reuse and reclamation wastewater requires nutrient management plans when total phosphorus is above 1 mg/L or total nitrogen is above 8 mg/L. Tracking these nutrient levels is necessary to determine whether a nutrient management plan may be needed in the future. Since the data for these nutrients were very low, the monitoring frequency has been reduced to annually.

Total Sodium – High salt concentrations reduce water uptake in plants and accumulate to undesirable levels in soils. So, annual monitoring via composite samples has been added in accordance with Guidance Memo 94-002 (Regional Directors Authorization to Process VPA Permits for Land Application of Municipal Wastewater).

Total (Cadmium, Copper, Lead, Nickel, Zinc) – Metals monitoring is necessary because there is a potential for accumulation of metals in soils and has been continued from the previous permit. Cadmium, copper, lead, nickel, and zinc monitoring frequency has been changed to 1/ 4 years via composite samples. Composite sample data collected in September of 2007 were below the ground water standards for all of the metals testing. This monitoring is in accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater) and required to determine if the concentrations are below the Virginia Ground Water Standards (9 VAC 25-280-10 et seq.).

C. **Part I. A. Limits and Monitoring Requirements – Irrigation Site Monitoring**

The spray application site area is covered with a mature hardwood forest with surface slopes ranging from 4 to 12 percent. The permittee does not anticipate any timber harvesting. A total of 12 of the 16 one acre sites are currently being irrigated during the months of June through August. The system was designed to dose 15 days per month. The permittee's irrigation schedule consists of dosing each field every other day for 45 minutes at a rate of 47 gpm.

Total Effluent Volume (gallons/month) – The volume of effluent applied to each field shall continue to be calculated to determine the irrigation rate for each field.

Hourly Maximum Application Rate, Weekly Maximum Application Rate – From May 2005 through August 2011, the permittee applied effluent at a maximum hourly rate of 0.10 inches and a maximum weekly rate of 0.78 inches (**Attachment C**). The application rate shall continue to be limited to an hourly rate of 0.25 inches and a weekly maximum application rate of 0.85 inches. The hourly rate is based on 9 VAC 25-790-880F Sewage Collection and Treatment (SCAT) Regulations rates and the weekly maximum application rate of 0.85 inches is based upon the calculated hydraulic rate for each application sites.

Effluent Nitrogen Applied, Nitrogen Applied Year-to-Date (to each site) – The total nitrogen applied in pounds shall continue to be calculated. This calculation is needed to calculate cumulative nitrogen loading to each site. The year-to-date calculations are based upon the calendar year.

Yearly Nitrogen Applied (to each site) – Nitrogen loading for each of the fields is found in **Attachment E**. In 2011, the total nitrogen loading for each active field was 3.1 pounds. The annual total nitrogen loading of 127 pounds per site has been continued from the previous permit. This value shall be in terms of calendar year. This nitrogen loading was based upon the nitrogen assimilative capacity of the forest and soil for nitrogen to prevent leaching of nitrogen into the ground water. Refer to **Attachment C** and the reissuance application for the nitrogen loading calculations. The limit calculation was based upon an applied wastewater concentration of 21 mg/L.

D. **Part I.A Limits and Monitoring Requirements – Soil Monitoring**

Soil sampling and analysis was performed in 1984 and 1985. A summary of soil characterization data from this study is included in the reissuance application. The upper soil profile is predominately loamy with slopes ranging from 6 to 25 percent. Depth to rock ranges from about three to more than 6 feet.

The permit required yearly soil monitoring for nutrient related parameters, pH, and soil organic matter. Once per 4 year monitoring was required for metals, particle size analysis, and conductivity. See **Attachment F** for a summary of the data. A soil monitoring plan will be required, and this requirement has been included as a special condition (Part I.C.2). Soil samples shall be representative of the predominant soil type at the sites. Soil monitoring is required as per Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater) and is necessary because there is a potential for accumulation of nutrients and metals in soils.

Soil Organic Matter, Soil pH, Total Nitrogen, Organic Nitrogen, Available Phosphorus, Total Nitrogen, Organic Nitrogen, Available Phosphorus, Exchangeable (Potassium, Sodium, Calcium, Magnesium), Cation Exchange Capacity – Monitoring for these parameters is in accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater). Monitoring via composite samples shall continue. The frequency has been changed from 1/year to 1/ 4 years to provide a soil characterization and track any changes in soil over time. Permits requiring nutrient management plans generally have soil testing requirements of once per three years.

Total (Cadmium, Copper, Lead, Nickel, Zinc) – No metals testing data was available for the soil. In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), monitoring via composite samples shall continue, and the frequency has been

revised from 1/ 5 years to 1/ 4 years to provide a soil characterization and track any changes in soil over time to ensure the maximum cumulative loading for each metal has not been reached.

Particle Size Analysis or USDA Textural Estimate – In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), monitoring via composite samples shall continue, and the frequency has been revised from 1 / 5 years to 1/ 4 years to provide a soil characterization and track any changes in soil over time.

Hydraulic Conductivity – In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), monitoring via composite samples shall continue with a revised frequency of 1/ 4 years to provide a soil characterization and track any changes in soil over time.

Soil Absorption Ratio (SAR) – The presence of calcium and magnesium and sodium ions counteracts negative impact of sodium on the permeability of the soil. The SAR is the ratio of the concentration of sodium ions (meg/L) to the concentration of calcium (meg/L) plus magnesium (meg/L). The reissuance application included a SAR calculation of 5.5. According to the Virginia Cooperative Extension publication Water Quality for Irrigation in Virginia Report (1991), a SAR greater than 10 may clog soil pores and significantly reduce soil permeability. In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), the SAR shall be calculated 1/ 4 years.

$$SAR = \frac{[Na^{+}]}{\sqrt{\frac{1}{2}([Ca^{2+}]+[Mg^{2+}])}}$$

D. **Part I.A Limits and Monitoring Requirements – Ground Water Monitoring**

In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), ground water monitoring is required to ensure ground water standards are not violated. There is one upgradient spring, one upgradient well, one downgradient spring, and one downgradient well. See **Attachment D** for a summary of the ground water monitoring data.

Static Water Level (elevation) – In accordance with Interim Guidance Memo 01-2005, monitoring of 1/quarter will continue to be measured.

Chlorides – In the upgradient well, one data value for chlorides was slightly higher than the chloride ground water standard. None of the other data from the upgradient or downgradient wells were above the ground water standard. In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), quarterly monitoring via grab samples has been continued from the previous permit.

Conductivity – In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), quarterly monitoring via grab samples has been continued from the previous permit.

Nitrate Nitrogen – For the quarterly data collected from March 2003 through December 2011, there were no violations of the nitrate ground water standard in the wells. However, data on September 2005, June 2008, and September 2008 for the downgradient spring water violated the nitrate ground water standard. On September 2008, there was also a spike in fecal coliform. There were no fecal coliform data in September 2005 or June 2008. There have been no nitrate ground water monitoring violations in the last two years. Additionally, the most recent hotel drinking water well nitrate data on December 30, 2011 was 1.5 mg/L which is below the nitrate ground water standard. So, it is possible that surface contaminants at the downgradient spring site may have been responsible for the elevated nitrate. Quarterly monitoring for nitrate via grab samples has been continued from the previous permit.

pH – Much of the pH data were below the ground water standard for both upgradient and downgradient wells. These low values are typical for the water from this site. There were no noticeable trends between upgradient and downgradient wells or springs. In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), quarterly monitoring via grab samples has been continued from the previous permit.

Fecal Coliform – With the exception of one datum of 80/100 mL in September 2005 for the downgradient spring, all of the fecal coliform data were extremely low. In 2006 and 2007 the maximum fecal coliform value was 1/100 mL. The wastewater has been disinfected and the data were very low. Therefore, fecal coliform may not be meaningful in tracking ground water changes. So, fecal coliform monitoring has been discontinued.

Total Organic Carbon, Ammonia as N, Total Kjeldahl Nitrogen (TKN) – All data were below the ground water standards. The data were very low and were not meaningful in tracking ground water changes. So, ground water monitoring for these parameters has been discontinued. Nitrate monitoring will provide a good indication of whether the irrigation water is causing any ground water violations.

Alkalinity, Hardness – The alkalinity and hardness of the surface water in this area are extremely low. Monitoring these parameters would not be meaningful in tracking ground water changes. So, ground water monitoring for these parameters has been discontinued.

Phosphorus – Data were very low and were not meaningful in tracking ground water changes. So, ground water monitoring for this parameter has been discontinued.

E. **Part I.B Special Conditions**

(1) **Compliance Reporting (Part I.B.1)**

Rationale: In accordance with VPDES Permit Regulation, 9 VAC 25-31-190 J4 and 220 I, DEQ is authorized to establish monitoring methods and procedures to compile and analyze data on water quality, as per 40 CFR Part 130, Water Quality Planning and Management, Subpart 130.4. This condition is necessary when toxic pollutants are monitored by the permittee and a maximum level of quantification and/or specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. This condition also establishes protocols for calculation of reported values.

(2) **Storm Water Discharge Exception (Part I.B.2)**

Rationale: The VPA Permit Regulation, 9 VAC 25-32-30A, requires that all pollutant management activities covered under a VPA permit maintain no point source discharge of pollutants to surface waters except in the case of a storm event greater than 25 year, 24 hour storm.

(3) **Indirect Dischargers (Part I.B.3)**

Rationale: Required by the VPA Permit Regulation, 9 VAC 25-32-90.A for all Publicly or Privately Owned Sewage Treatment Works.

(4) **95% Capacity Reopener (Part I.B.4)**

Rationale: This condition requires that the permittee address problems resulting from high influent flows, in a timely fashion, to avoid non-compliance and water quality problems from plant overloading. This requirement, for all POTW and PVOTW permits, is contained in 9 VAC 25-32-90B of the VPA Permit Regulation.

(5) **Licensed Operator Requirement (Part I.B.5)**

Rationale: The VPA Permit Regulation, 9 VAC 25-32-190A, B, and C and the Code of Virginia § 54.1-2300 et seq., Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 et seq.), require licensure of operators. A Class III operator is required for this municipal wastewater treatment plant.

(6) **Materials Storage and Handling (Part I.B.6)**

Rationale: 9 VAC 25-32-30A requires that all pollutant management activities covered under a VPA permit shall maintain no point source discharge of pollutants to surface water except in the case of a storm event greater than the 25-year, 24 hour storm. This condition is required for facilities with materials storage to ensure State waters are protected through proper handling.

(7) **Operations and Maintenance Manual Requirement (Part I.B.7)**

Rationale: Submittal of the Manual to DEQ for approval is required by the Code of Virginia Section § 62.1-44.19; the Sewage Collection and Treatment Regulations, 9 VAC 25-790; and the VPA Permit Regulation, 9 VAC 25-32-80D, to provide an opportunity for review of current and proposed operations of the facility. Within 90 days from the effective date of the permit, the permittee is required to submit an updated Manual.

(8) **Reliability Class (Part I.B.8)**

Rationale: A Reliability Class I has been assigned to the sanitary sewage treatment plant at the facility. Reliability class designations are required by Sewerage Collection and Treatment Regulations, 9 VAC 25-790 for all municipal facilities.

(9) **Sewage Sludge Reopener (Part I.B.9)**

Rationale: This condition is required by VPDES Permit Regulation, 9 VAC 25-31-220 C4 for all permits issued to treatment works treating domestic sewage. This condition provides that the permit may be modified to include a more stringent sewage sludge standard.

(10) **Site Specification (Part I.B.10)**

Rationale: In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater) and the VPA Permit Manual, effluent shall only be applied to sites specified in Attachment A of the permit.

(11) **Operational Requirements (Part I.B.11)**

Rationale: In accordance with 9 VAC 25-790-880G.9 of the Sewage Collection and Treatment Regulations and the VPA Permit Manual, land application is prohibited during periods of inclement weather.

(12) **Monthly Activity Summary Report (Part I.B.12)**

Rationale: In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater) a summary report of monthly activities including monitoring requirements described in Part I.A of the permit is required. Reporting forms are due in accordance with the schedule in Attachment B of the permit.

(13) **Annual Project Summary Report (Part I.B.13)**

Rationale: An annual summary report is required to ensure that the land application system is being properly operated and maintained and that no adverse environmental impacts are being observed due to the land application activities. This standard condition is in accordance with the VPA Permit Manual and Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater).

(14) **Buffer Zones (Part I.B.14)**

Rationale: In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), setback distances are established and these restrictions are consistent with requirements in 9 VAC 25-740-170G of the Water Reclamation and Reuse Regulation.

(15) **Wind Restrictions (Part I.B.15)**

Rationale: This special condition is consistent with 9 VAC 25-740-170G of the Water Reclamation and Reuse Regulation and requires restrictions on land applying during windy conditions.

(16) **Permit Application Requirement (Part I.B.16)**

Rationale: The VPA Permit Regulation, 9 VAC 25-32-60.B, requires submission of a new application at least 180 days prior to expiration of the existing permit. In addition, the VPA Permit Regulation, 9 VAC 25-32-60A.1.a, notes that a permit shall not be issued before receiving a complete application.

(17) **Ground Water Monitoring Plan (Part I.C.1)**

Rationale: In accordance with Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater), Guidance Memo 98-2010 (VPDES Permit and VPA Permit Ground Water Monitoring Plans), 9 VAC 25-790-880 of the Sewage Collection and Treatment Regulations, and the VPA Permit Manual, this condition is used when a ground water plan has been approved and monitoring is required. Continued ground

water monitoring may determine whether there are violations to the Ground Water Standards set forth in 9 VAC 25-260-210.

(18) **Soil Monitoring Plan (Part I.C.2)**

Rationale: In accordance with 9 VAC 25-32-460 of the VPA Permit Regulation, this condition requires a soil sampling protocol to ensure that the soil data submitted is representative of the soil conditions at the land application sites. The plan allows the permittee to provide representative sample(s) based upon soil characteristics among the different irrigation sites in lieu of soil samples from each irrigation field. Guidelines for soil sampling are found in 9 VAC 25-790-880C of the Sewage Collection and Treatment Regulations. Additional sampling recommendations may be found in the Virginia Agronomy Handbook.

(19) **Facility Closure Plan (Part I.C.3)**

Rationale: This condition is used to notify the owner of the need for a closure plan in the event a treatment works is being replaced or is expected to close. In accordance with State Water Control Law § 62.1-44.19 and 9 VAC 25-32-550E.6 of the VPA Permit Regulation requires that an appropriate plan of closure or abandonment be developed and approved by the board.

(20) **Conditions Applicable to All VPA Permits (Part II)**

Rationale: VPDES Permit Regulation, 9 VAC 25-32-80, requires all VPA permits to contain or specifically cite the conditions listed.

14. **Compliance Schedules:** For this reissuance, there are no compliance schedules.

15. **Changes to the permit from the previous reissuance:**

A. **The following special condition has been deleted from the permit:**

Total Residual Chlorine (TRC) Monitoring (Part I.C) – The condition to allow the permittee to monitor at a different location if a study is done has been deleted.

B. **Special conditions that have been modified from the previous permit are listed below: (The referenced permit sections are for the new permit.)**

1. The No Discharge Special Condition as been renamed Storm Water Exception (Part I.B.2) in accordance with the VPA Permit Manual.

2. The Operations and Maintenance Manual Special Condition (Part I.B.7) has been revised in accordance with the VPA Permit Manual to require the inclusion of sampling and permit compliance procedures.

3. The Operational Requirements Special Conditions (Part I.B.11) has been revised to include restrictions recommended by Interim Guidance Memo 01-2005 and the VPA Permit Manual.

4. The Monthly Activity Summary Report Special Condition (Part I.B.12) has been revised to reflect changes in monitoring requirements.

5. The Annual Activity Summary Report Special Condition (Part I.B.13) has been revised to reflect changes in the monitoring requirements.

6. Part A of Part II - Conditions Applicable to All VPA Permits has been revised to include the requirement that samples be analyzed by a VELAP certified laboratory.

C. **New special conditions added to the permit are listed below:**

1. A Compliance Reporting Special Condition (Part I.B.1) has been added to ensure that adequate quantification levels are selected and describe the reporting procedures for monthly average and weekly average monitoring requirements associated with effluent monitoring. This special condition is in accordance with the VPDES Permit Manual for municipal effluent monitoring.

2. A Reliability Class Special Condition (Part I.B.8) has been added in accordance with the VPA Manual to ensure that the Sewage Collection and Treatment Regulations regarding the reliability class requirements for this treatment plant are met.

3. A Sewage Sludge Reopener Special Condition (Part I.B.9) has been added in accordance with the VPDES Permit Manual which requires this condition for treatment facilities that generate sewage sludge.

4. A Buffer Zones Special Condition (Part I.B.14) has been added in accordance with the VPA Permit Manual for land application sites.

5. A Wind Restrictions Special Condition (Part I.B.15) has been added in accordance with the VPA Permit Manual for land application sites.

6. A Permit Application Requirement Special Condition (Part I.B.16) has been added to remind the permittee of the requirement to submit a reissuance application six months prior to the expiration of the permit.

7. A Ground Water Monitoring Plan Special Condition (Part I.C.1) has been added to document standard procedures ground water monitoring in accordance with the VPA Permit Manual.

8. A Soil Monitoring Plan Special Condition (Part I.C.2) has been added to require a protocol for soil sampling.

9. A Facility Closure Plan Special Condition (Part I.C.3) has been added in accordance with the VPA Permit Manual to require submission of a closure plan in the event that the treatment works is upgraded or closed.

D. **Permit Limits and Monitoring Requirements:** See Table VII on page 24-28 for details on changes to effluent, soil, and ground water monitoring requirements.

16. **Public Notice Information per 9 VAC 25-32-120.B:**

All pertinent information is on file and may be inspected, and copied by contacting Becky L. France at:

Virginia Department of Environmental Quality
Blue Ridge Regional Office
3019 Peters Creek Road
Roanoke, VA 24019
(540) 562-6700
becky.france@deq.virginia.gov

Persons may comment in writing or by e-mail to the DEQ on the proposed permit action and may request a public hearing during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for the comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state (1) the reason why a hearing is requested; (2) a brief informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and (3) specific references, where possible, to terms and conditions of the permit with suggested revisions.

Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given. The public may review the draft permit and application at the Blue Ridge Regional Office in Roanoke by appointment. A copy of the public notice is found in **Attachment G**.

17. **Additional Comments**

A. **Reduced Monitoring:** In accordance with Guidance Memo 98-2005, all permit applications received after May 4, 1998, are considered for reduction in effluent monitoring frequency. Only facilities having exemplary operations that consistently meet permit requirements may qualify for reduced monitoring. To qualify for consideration of reduced monitoring requirements, the facility should not have been issued any Warning Letters, Notices of Unsatisfactory Laboratory Compliance, Letter of Noncompliance (LON) or Notices of Violation (NOV), or be under any Consent Orders, Consent Decrees, Executive Compliance Agreements, or related enforcement documents during the past three years. The BOD_5, nitrogen, *E. coli*, and pH limits ensure that the effluent meets the criteria for land application. Since the effluent is stored in a 3 million gallon storage tank and the effluent is not applied throughout the year, it is necessary to maintain the current monitoring frequency for the parameters with limits.

B. **Previous Board Action:** None

C. **Staff Comments:** Following a DEQ compliance staff review, revisions were made on April 11, 2012. The changes are as follows:

The permit expiration date was changed from slightly less than ten years to a ten year period.

The monitoring frequencies with 1/ 5 years were changed to 1/ 4 years to ensure that the data arrives prior to the expiration of the permit. The number of samples collected during the 1/ 4 year period will remain the same.

The *E. coli* monitoring data for ground water were very low, and so this parameter was removed from the ground water monitoring.

The parameters "other nitrogen applied" and "total nitrogen applied yield" were removed because supplemental fertilizer is not applied to the forest.

Several Agency Guidance Memo numbers were referenced incorrectly, and these typographical errors were corrected.

Following a DEQ Office of Land Application Programs review, revisions were made on April 18, 2012. The changes are as follows:

The *E. coli* limit was for the effluent monitoring from the sewage treatment plant was changed from 36 N/100 mL to 18 N/100 mL to be consistent with the Sewage Collection and Treatment Regulations. An *E. coli* limit of 18 N/100 mL was also included for the effluent storage tank monitoring.

The maximum application rate monitoring frequencies were moved from the storage tank monitoring page to the land application monitoring page of Part I to reflect the fact that the application rate limits are for each field. The formula for calculating effluent nitrogen applied was added as a footnote to the land application site monitoring page. Typographical errors in the monitoring frequencies in the land application parameters were corrected.

Soil monitoring for Sodium Absorption Ratio (SAR) was added. This SAR is a calculated parameter that does not require any additional monitoring.

The Certificate to Construct/ Operate (CTC/CTO) Special Condition was removed from the draft because the treatment facility has already been constructed and therefore it is not anticipated that a CTC or CTO will be needed for this facility.

The wording of the Facilities Closure Plan Special Condition (Part I.C.3) was reworded to clarify the requirements.

Part II – Conditions Applicable to All VPA Permits was revised to be consistent with new Agency VPA permit language.

The public notice was revised to include the number of acres approved for land application.

D. **Public Comment:** No comments were received during the public comment period.

E. **Tables**

Table I	Discharge Description (Page 2)
Tables II-VI	Basis for Monitoring Requirements (Pages 19-23)
Table VII	Permit Processing Change Sheets (Page 24-28)

18. **Attachments**

A. Maps
- Facility Diagrams
- Topographic Map

B. Site Inspection Report

C. Effluent Data and Calculations
- Effluent Data (before storage)
- Effluent Data (after storage)
- Excerpt from EPA Process Design Manual of Land Treatment of Municipal Wastewater Effluent (2006)

D. Ground Water Monitoring
- Ground Water Monitoring Plan
- Ground Water Data

E. Land Application Site Information
- Land Application Data
- Nitrogen Loading Calculations

F. Soil Monitoring
- Soil Series Information
- Soil Maps
- Soil Data

G. Public Notice

Table II
BASIS FOR LIMITATIONS – MUNICIPAL
DESIGN CAPACITY: 0.035 MGD

( ) Interim Limitations
(x) Final Limitations

Effective Dates - From: Effective Date
To: Expiration Date

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	4	NL	NA	NA	NL	1/Day	Measured
pH (Standard Units)	1,4	NA	NA	6.0	9.0	1/Day	Grab
BOD_5	1,4	NL mg/L	NA	NA	60 mg/L	1/Month	Grab
Total Suspended Solids	4	NL mg/L	NL mg/L	NA	NA	1/Month	Grab
E. coli	1,4	NA	NA	NA	18 N/100 mL	1/Month	Grab
Total Residual Chlorine	1,4	NA	NA	2.0 mg/L	NA	1/Day	Grab
Volume in Storage	5	NL MG	NA	NA	NA	1/Day	Calculated
Remaining Storage Capacity	5	NA	NA	NL MG	NA	1/Day	Calculated

NA = Not Applicable NL = No Limitations; monitoring only

The basis for the limitations codes are:
1. 9 VAC 25-790-880 (Sewage Collection and Treatment Regulations)
2. 9 VAC 25-32-10 et seq. (VPA Permit Regulation)
3. 9 VAC 25-280-10 et seq. (Ground Water Standards)
4. Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater)
5. Guidance Memo 94-002 (Regional Directors Authorization to Process VPA Permits for Land Application of Land Application of Municipal Wastewater)
6. Best Professional Judgment

TABLE III
Storage Tank Monitoring

Parameter	Basis for Limits	EFFLUENT MONITORING			
		Limitations	Units	Monitoring Requirements	
				Frequency	Sample Type
Volume from Storage	5	NL	MG	Continuous	TIRE*
BOD_5	6	NL	mg/L	1/Month	Composite
pH	4	NL	S.U.	1/Month	Grab
E. coli (maximum)	1	NL	18/100 mL	1/Month	Grab
Total Kjeldahl Nitrogen	4	NL	mg/L	1/Month	Composite
Ammonia Nitrogen	4	NL	mg/L	1/Month	Composite
Nitrate Nitrogen	4	NL	mg/L	1/Month	Composite
Nitrogen, Total	6	NL	mg/L	1/Month	Calculated
Phosphorus, Total	4	NL	mg/L	1/Year	Composite
Potassium, Total	4	NL	mg/L	1/Year	Composite
Sodium, Total	4,5	NL	mg/L	1/Year	Composite
Cadmium, Total Recoverable	4	NL	mg/L	1/ 4 Years	Composite
Copper, Total Recoverable	3,4	NL	mg/L	1/ 4 Years	Composite
Lead, Total Recoverable	3.4	NL	mg/L	1/ 4 Years	Composite
Nickel, Total Recoverable	3,4	NL	mg/L	1/ 4 Years	Composite
Zinc, Total Recoverable	3,4	NL	mg/L	1/ 4 Years	Composite

*TIRE – totalizing, indicating, and recording equipment

1. 9 VAC 25-790 et seq. (Sewage Collection and Treatment Regulations)
2. 9 VAC 25-32-10 et seq. (VPA Permit Regulation)
3. 9 VAC 25-280-10 et seq. (Ground Water Standards)
4. Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater)
5. Guidance Memo 94-002 (Regional Directors Authorization to Process VPA Permits for Land Application of Land Application of Municipal Wastewater)
6. Best Professional Judgment

TABLE IV
Land Application Site Monitoring
(Each Application Site)

Parameter	Basis for Limits	MONITORING			
		Limitations	Units	Monitoring Requirements	
				Frequency	Sample Type
Total Effluent Volume Applied	6	NL	gallons	1/Month	Calculated
Hourly Maximum Application Rate	1,4	0.25	inches/hour	1/Month	Calculated
Weekly Maximum Application Rate	1,4,6	0.85	inches/week	1/Month	Calculated
Effluent Applied (inches)	6	NL	inches/month	1/Month	Calculated
Effluent Total Nitrogen Applied	6	NL	pounds	1/Month	Calculated
Total Nitrogen Applied Year-to-Date	6	NL	pounds	1/Month	Calculated
Yearly Total Nitrogen Applied	6	127	pounds	1/Year	Calculated

1. 9 VAC 25-790-880 (Sewage Collection and Treatment Regulations)
2. 9 VAC 25-32-10 et seq. (VPA Permit Regulation)
3. 9 VAC 25-280-10 et seq. (Ground Water Standards)
4. Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater)
5. Guidance Memo 94-002 (Regional Directors Authorization to Process VPA Permits for Land Application of Land Application of Municipal Wastewater)
6. Best Professional Judgment

TABLE V
Soil Monitoring

Parameter	Basis for Limits	MONITORING			
		Limitations	Units	Monitoring Requirements	
				Frequency	Sample Type
Soil Organic Matter	4	NL	%	1/ 4 Years	Composite
Soil pH	4	NL	S.U.	1/ 4 Years	Composite
Total Nitrogen	4	NL	ppm	1/ 4 Years	Composite
Organic Nitrogen	4	NL	ppm	1/ 4 Years	Composite
Available Phosphorus	4	NL	ppm	1/ 4 Years	Composite
Exchangeable Potassium	4	NL	mg/100g	1/ 4 Years	Composite
Exchangeable Sodium	4	NL	mg/100g	1/ 4 Years	Composite
Exchangeable Calcium	4	NL	mg/100g	1/ 4 Years	Composite
Exchangeable Magnesium	4	NL	mg/100g	1/ 4 Years	Composite
Cation Exchange Capacity (CEC)	4	NL	meq/100g	1/ 4 Years	Composite
Cadmium, Total	3,4	NL	ppm	1/ 4 Years	Composite
Copper, Total	3,4	NL	ppm	1/ 4 Years	Composite
Lead, Total	3,4	NL	ppm	1/ 4 Years	Composite
Nickel, Total	3,4	NL	ppm	1/ 4 Years	Composite
Zinc, Total	3,4	NL	ppm	1/ 4 Years	Composite
Particle Size Analysis or USDA Textural Estimate	4	NL	%	1/ 4 Years	Composite
Hydraulic Conductivity (in most restrictive soil horizon)	4	NL	in/hr	1/ 4 Years	Composite
Soil Absorption Ratio (SAR)	6	NL	none	1/ 4 Years	Calculated

1. 9 VAC 25-790-880 (Sewage Collection and Treatment Regulations)
2. 9 VAC 25-32-10 et seq. (VPA Permit Regulation)
3. 9 VAC 25-280-10 et seq. (Ground Water Standards)
4. Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater)
5. Guidance Memo 94-002 (Regional Directors Authorization to Process VPA Permits for Land Application of Land Application of Municipal Wastewater)
6. Best Professional Judgment

TABLE VI
Ground Water Monitoring (Sites M-1, M-2, M-3, M-4)

Parameter	Basis for Limits	MONITORING			
		Limitations	Units	Monitoring Requirements	
				Frequency	Sample Type
Static Water Level (elevation)	4	NL	feet	1/Quarter	Measured
Chlorides	3,4	NL	mg/L	1/Quarter	Grab
Conductivity	4	NL	mmhos/cm	1/Quarter	Grab
Nitrate Nitrogen	3,4	NL	mg/L	1/Quarter	Grab
pH	3,4	NL	S.U.	1/Quarter	Grab

1. 9 VAC 25-790-880 (Sewage Collection and Treatment Regulations)
2. 9 VAC 25-32-10 et seq. (VPA Permit Regulation)
3. 9 VAC 25-280-10 et seq. (Ground Water Standards)
4. Interim Guidance Memo 01-2005 (Spray Irrigation and Reuse of Wastewater)
5. Guidance Memo 94-002 (Regional Directors Authorization to Process VPA Permits for Land Application of Land Application of Municipal Wastewater)
6. Best Professional Judgment

Table VII-1
PERMIT PROCESSING CHANGE SHEET

LIMITS AND MONITORING SCHEDULE:

Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason for Change	Date
	From	To	From	To		
Effluent Monitoring (before storage)						
E. coli	NA	1/Month	NA	18 N/100 mL maximum	In accordance with the SCAT Regulations, *E. coli* limit added to ensure adequate disinfection.	3/2/12
BOD_5			NL monthly average, NL weekly average, 60 mg/L maximum	NL monthly average, 60 mg/L maximum	The SCAT Regulations require a maximum monthly limit and a maximum weekly average would not be useful information and the reporting form does not have a separate space for weekly average and maximum.	3/12/12
Total Suspended Solids			NL mg/L NL kg/d monthly average; NL mg/L NL kg/d weekly average	NL mg/L monthly; NL mg/L weekly average	This effluent is not discharged and loading calculations are not required by the SCAT Regulations or Guidance Memo 01-2005.	3/2/12
Effluent Monitoring – Storage Tank						
Fecal Coliform	1/Month	NA	NL N/100 mL	NA	Fecal coliform monitoring has been replaced by *E. coli* monitoring because the water quality standards are written in terms of *E. coli*.	3/2/12
E. coli	NA	1/Month	NA	18 N/100 mL	Fecal coliform monitoring has been replaced by *E. coli* monitoring because the water quality standards are written in terms of *E. coli* and a limit added as required by the SCAT Regulations.	3/2/12
Phosphorus, Total	1/Quarter	1/Year			Due to the low phosphorus effluent concentration and since nitrogen is the limiting nutrient, the monitoring frequency has been reduced.	3/2/12
Potassium, Total	1/Quarter	1/Year			Due to the low potassium effluent concentration and since nitrogen is the limiting nutrient, the monitoring frequency has been reduced.	3/2/12
Sodium, Total	1/Quarter	1/Year	NA	NL mg/L	In accordance with Guidance Memo 94-002, sodium monitoring has been added.	3/2/12

Table VII-2
PERMIT PROCESSING CHANGE SHEET

LIMITS AND MONITORING SCHEDULE:

Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason for Change	Date
	From	To	From	To		
Effluent Monitoring – Storage Tank (Continued)						
Total Nitrogen	NA	1/Month	NA	NL mg/L	Nitrogen concentration needed to determine the nitrogen loading for each site.	3/2/12
Cadmium, Total Recoverable	1/ 5 Years	1/ 4 Years			To ensure that all data are collected prior to when the next reissuance application is due, the due date has been revised. This revision does not result in the collection of any more data.	4/11/12
Copper, Total Recoverable	1/ 5 Years	1/ 4 Years			To ensure that all data are collected prior to when the next reissuance application is due, the due date has been revised. This revision does not result in the collection of any more data.	4/11/12
Lead, Total Recoverable	1/ 5 Years	1/ 4 Years			To ensure that all data are collected prior to when the next reissuance application is due, the due date has been revised. This revision does not result in the collection of any more data.	4/11/12
Nickel, Total Recoverable	1/ 5 Years	1/ 4 Years			To ensure that all data are collected prior to when the next reissuance application is due, the due date has been revised. This revision does not result in the collection of any more data.	4/11/12
Zinc, Total Recoverable	1/ 5 Years	1/ 4 Years			To ensure that all data are collected prior to when the next reissuance application is due, the due date has been revised. This revision does not result in the collection of any more data.	4/11/12
Effluent Monitoring – Land Application Sites						
Effluent Nitrogen Applied (each site)	NA	1/Month	NA	NL pounds	Monthly monitoring parameter added to provide nitrogen loading tracking on a per site basis. Data are used to determine compliance with annual nitrogen loading limit for each site.	3/2/12
Total Nitrogen Applied Year-to-Date (each site)	NA	1/Month	NA	NL pounds	Monthly monitoring parameter added to provide nitrogen loading tracking on a per site basis. Data are used to determine compliance with annual nitrogen loading limit for each site.	3/12/12

Table VII-3
PERMIT PROCESSING CHANGE SHEET

LIMITS AND MONITORING SCHEDULE:

Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason for Change	Date
	From	To	From	To		
Other Nitrogen Applied (manure, etc.)	1/Month	NA	NL lb/acre	NA	Since there is no crop harvesting, no other fertilizers are applied to the sites. So, this parameter is not relevant.	4/11/12
Total Nitrogen applied YTD	1/Month	NA	NL lb/acre	NA	Since there is no crop harvesting, no other fertilizers are applied to the sites. The effluent nitrogen applied represents the total nitrogen applied to the sites. So, this parameter is not relevant.	4/11/12
Soil Monitoring						
Soil Organic Matter	1/Year	1/ 4 Years			Effluent nutrient concentration is low, and effluent is applied to forest where there is no harvesting. So, a reduced monitoring frequency will provide adequate data for nutrient tracking and characterization of soil.	3/2/12
Soil pH	1/Year	1/ 4 Years			Effluent nutrient concentration is low, and effluent is applied to forest where there is no harvesting. So, a reduced monitoring frequency will provide adequate data for nutrient tracking and characterization of soil.	3/2/12
Nitrogen, Total	1/Year	1/ 4 Years			Effluent nutrient concentration is low, and effluent is applied to forest where there is no harvesting. So, a reduced monitoring frequency will provide adequate data for nutrient tracking and characterization of soil.	3/2/12
Organic Nitrogen	1/Year	1/ 4 Years			Effluent nutrient concentration is low, and effluent is applied to forest where there is no harvesting. So, a reduced monitoring frequency will provide adequate data for nutrient tracking and characterization of soil.	3/2/12, 4/11/12
Available Phosphorus	1/Year	1/ 4 Years			Effluent nutrient concentration is low, and effluent is applied to forest where there is no harvesting. So, a reduced monitoring frequency will provide adequate data for nutrient tracking and characterization of soil.	3/2/12, 4/11/12

Table VII-4
PERMIT PROCESSING CHANGE SHEET

LIMITS AND MONITORING SCHEDULE:

Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason for Change	Date
	From	To	From	To		
Soil Monitoring (Continued)						
Exchangeable Potassium	1/Year	1/ 4 Years			Effluent nutrient concentration is low, and effluent is applied to forest where there is no harvesting. So, a reduced monitoring frequency will provide adequate data for nutrient tracking and characterization of soil.	3/2/12, 4/11/12
Exchangeable Sodium	1/Year	1/ 4 Years			Effluent nutrient concentration is low, and effluent is applied to forest where there is no harvesting. So, a reduced monitoring frequency will provide adequate data for nutrient tracking and characterization of soil.	3/2/12, 4/11/12
Exchangeable Calcium	1/Year	1/ 4 Years			Effluent nutrient concentration is low, and effluent is applied to forest where there is no harvesting. So, a reduced monitoring frequency will provide adequate data for nutrient tracking and characterization of soil.	3/2/12, 4/11/12
Exchangeable Magnesium	1/Year	1/ 4 Years			Effluent nutrient concentration is low, and effluent is applied to forest where there is no harvesting. So, a reduced monitoring frequency will provide adequate data for nutrient tracking and characterization of soil.	3/2/12, 4/11/12
Cation Exchange Capacity (CEC)	1/Year	1/ 4 Years			Effluent nutrient concentration is low, and effluent is applied to forest where there is no harvesting. So, a reduced monitoring frequency will provide adequate data for nutrient tracking and characterization of soil.	3/2/12, 4/11/12
Cadmium, Total	1/ 5 Years	1/ 4 Years			To ensure that all data are collected prior to when the next reissuance application is due, the due date has been revised. This revision does not result in the collection of any more data.	4/11/12
Copper, Total	1/ 5 Years	1/ 4 Years			To ensure that all data are collected prior to when the next reissuance application is due, the due date has been revised. This revision does not result in the collection of any more data.	4/11/12
Lead, Total	1/ 5 Years	1/ 4 Years			To ensure that all data are collected prior to when the next reissuance application is due, the due date has been revised. This revision does not result in the collection of any more data.	4/11/12

Table VII-5
PERMIT PROCESSING CHANGE SHEET

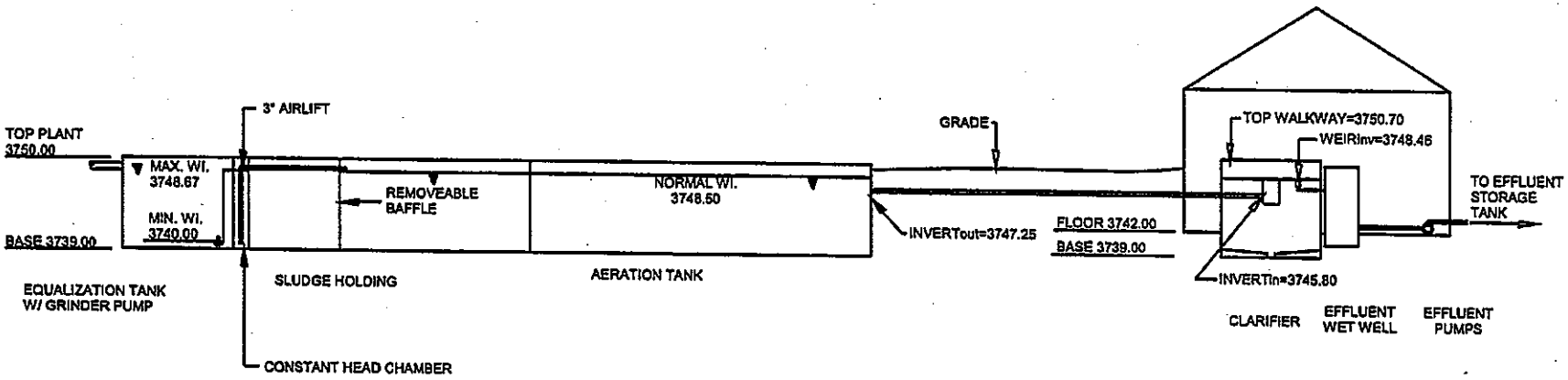
LIMITS AND MONITORING SCHEDULE:

Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason for Change	Date
	From	To	From	To		
Soil Monitoring (Continued)						
Nickel, Total	1/ 5 Years	1/ 4 Years			To ensure that all data are collected prior to when the next reissuance application is due, the due date has been revised. This revision does not result in the collection of any more data.	4/11/12
Zinc, Total	1/ 5 Years	1/ 4 Years			To ensure that all data are collected prior to when the next reissuance application is due, the due date has been revised. This revision does not result in the collection of any more data.	4/11/12
Sodium Absorption Ratio (SAR)	NA	1/ 4 Years	NA	NL	This ratio is calculated to determine if the soil permeability is being affected by sodium in the effluent applied to the land application sites.	4/18/12
Ground Water Monitoring						
Total Organic Carbon (TOC)	1/Year	NA	NL mg/L	NA	Data were low and not meaningful for interpreting whether ground water is contaminated.	3/2/12
Alkalinity (as $CaCO_3$)	1/Year	NA	NL mg/L	NA	Data were low and not meaningful for interpreting whether ground water is contaminated.	3/2/12
Fecal Coliform	1/Year	NA	NL N/100 mL	NA	Data were low and not meaningful for determining whether ground water is contaminated.	3/2/12
Hardness	1/Year	NA	NL mg/L	NA	Spring data were low and not meaningful for interpreting whether ground water is contaminated.	3/2/12
Ammonia Nitrogen	1/Year	NA	NL mg/L	NA	Data were low and not meaningful for interpreting whether ground water is contaminated.	3/2/12
Total Kjeldahl Nitrogen	1/Year	NA	NL mg/L	NA	Data were low and not meaningful for interpreting whether ground water is contaminated.	3/2/12
Phosphorus	1/Year	NA	NL mg/L	NA	Data were low and not meaningful for interpreting whether ground water is contaminated.	3/2/12

Attachment A

Maps

- **Facility Diagrams**
- **Topographic Map**



Hydraulic Profile Mountain Lake, Virginia

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Virginia - North Carolina - Tennessee
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Blacksburg, VA 24060
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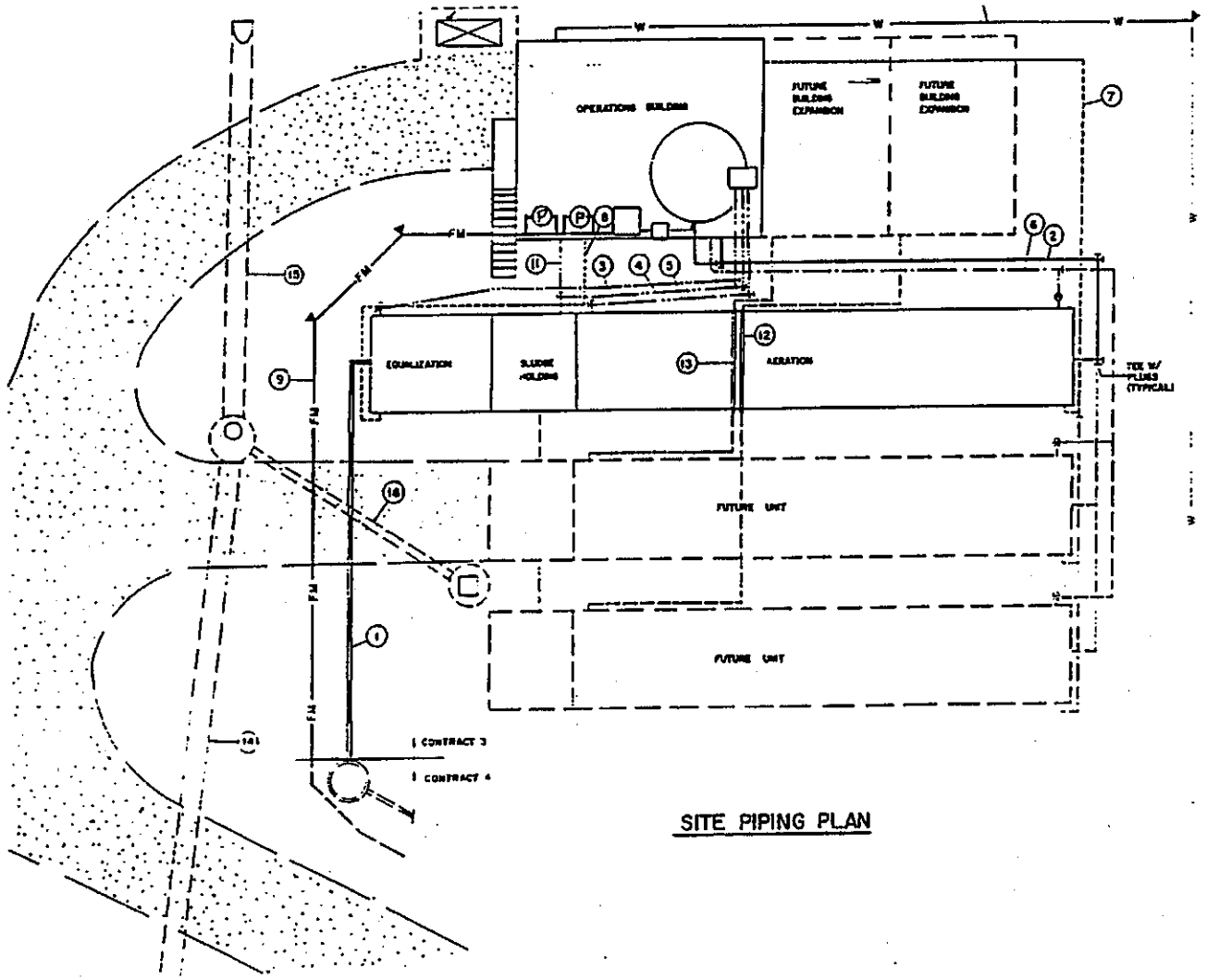
MOUNTAIN LAKE

PIPING LEGEND

- INFLUENT SEWER
- MIXED LIQUOR
- FM — FORCE MAIN
- W — POTABLE WATER
- NONPOTABLE WATER
- SLUDGE LINE
- LABORATORY DRAIN
- AIR LINE
- FUTURE LINES
- E — 2" ELECTRICAL CONDUIT
- STORM SEWER

SITE PIPING SCHEDULE

PIPE NO.	DESCRIPTION	SIZE (IN.)	LENGTH (FT.)	MATERIAL	REMARKS
1	INFLUENT SEWER	8"	52'	DIP	
2	AERATION EFFLUENT	6"	66'	DIP	
3	EQUALIZATION SLUDGE RETURN	4"	52'	DIP	SLOPE @ 1% MIN. FROM BLDG.
4	WASTE SLUDGE	4"	32'	DIP	SLOPE @ 1% MIN. FROM BLDG.
5	AERATION SLUDGE RETURN	4"	28'	DIP	SLOPE @ 1% MIN. FROM BLDG.
6	FROTH SPRAY LINE	2"	53'	DIP	MIN. 6" COVER
7	AERATION AIR LINE	28"	85'	GALV.	
8	EQUALIZATION AIR LINE	2"	53'	GALV.	
9	EFFLUENT FORCE MAIN	6"	83'	DIP	MIN. 6" COVER
10	POTABLE WATER	2"	165'	PVC	MIN. 6" COVER
11	LABORATORY DRAIN	4"	6'	DIP	SLOPE @ 1% MIN. FROM BLDG.
12	SLUDGE RETURN	4"	-	DIP	THROUGH STP-PLUG FOR FUTURE CONNECTION
13	SLUDGE RETURN	4"	-	DIP	THROUGH STP-PLUG FOR FUTURE CONNECTION
14	STORM SEWER	30"	22'	CONC.	UPST. INV = 3752.0 DNST. INV = 3743.5
15	STORM SEWER	30"	51'	CONC.	UPST. INV = 3742.5 DNST. INV = 3738.0
16	STORM DRAIN	12"	34'	CONC.	UPST. INV = 3747.0 DNST. INV = 3745.0



SITE PIPING PLAN

Site Piping Schedule Mountain Lake, Virginia

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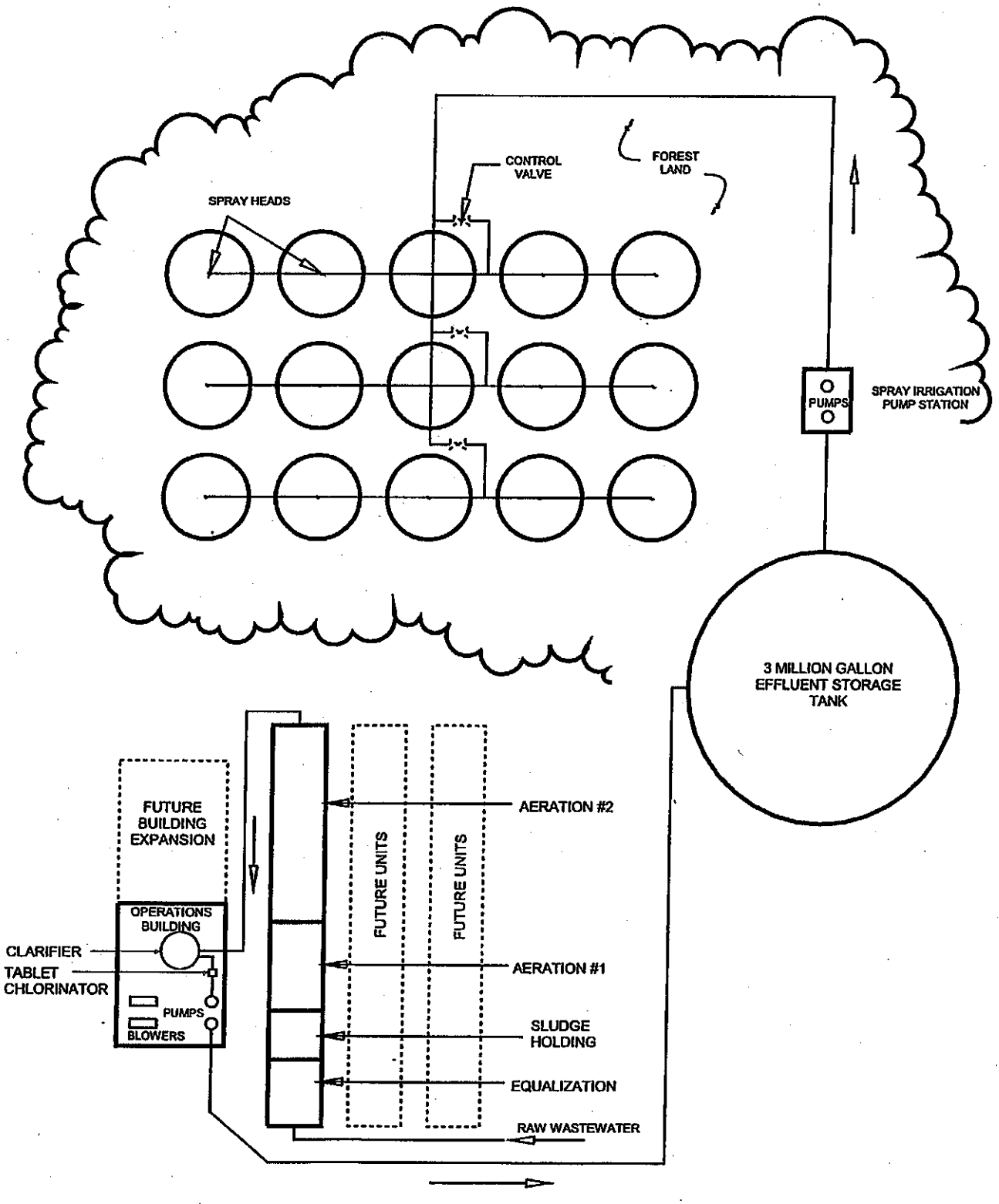

Schematic for Layout of Wastewater Treatment System Mountain Lake, Virginia

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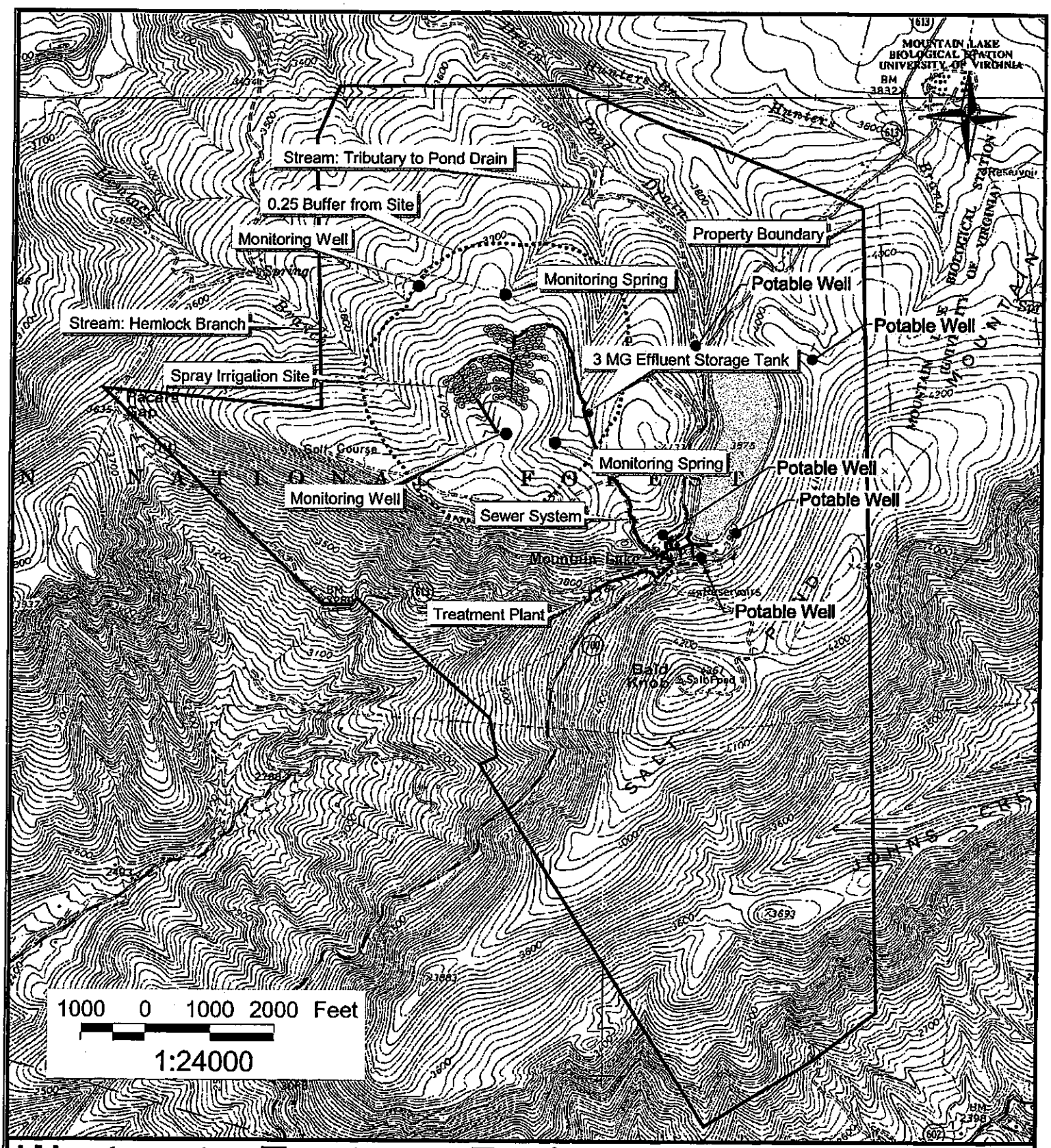
MOUNTAIN LAKE



Wastewater Treatment Facilities with Spray Irrigation
Mountain Lake, Virginia

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MOUNTAIN LAKE

Attachment B

Site Inspection Report

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Site Inspection Report for Mountain Lake Hotel
Reissuance of VPA Permit No.VPA02058

TO: Permit File

FROM: Becky L. France, Environmental Engineer Senior BLF

DATE: September 12, 2011

On July 29, 2011, I conducted a site inspection of the wastewater works for Mountain Lake Hotel. Mr. Ron Smith, operator for the wastewater treatment system, was present at the inspection. Mountain Lake Hotel is located in Giles County. There is one drinking water well onsite that serves the hotel and rental cabins. The resort consists of 116 rental rooms, a 125-seat dining room, and conference and recreational facilities. There is a grease trap for the dining facility that is pumped once a year.

Wastewater Treatment Plant

The system consists of a package treatment system that began operation in 1989 to provide year-round operation with an average design flow of 35,000 gallons per day. The extended aeration package plant consists of bar screen, dual grit removal channels, equalization basin, aeration basin, clarifier, sludge holding tank, tablet chlorinator, effluent pumps, three million gallon storage tank, and a spray irrigation system. Flow is measured by a 2-inch influent Parshall flume with ultrasonic sensor/recorder.

The collection system consists of a gravity sewer and one pump station. The Main Lodge, Chestnut Lodge, Lakeview Lodge, and the conference center are served by a gravity sewer. There are eight cottages that are served by a submersible grinder type pump station rated at 24 gpm. Wastewater enters the plant though an 8-inch sewer and flows through a bar screen and then into a grit channel. The grit sump is reportedly cleaned about every two weeks. Since the facility is location in a wooded area chicken wire covers the screening/grit unit during the fall/winter to prevent blockage from leaves.

The wastewater passes through a Parshall flume and then a communuitor before entering a 12,000 gallon equalization basin. The pH of the influent is checked daily and a hydrated lime slurry added occasionally as needed. The equalization basin has submersibles effluent transfers pumps controlled by float switches. The discharge from the equalization basin is adjusted by overflow weirs. Then, the wastewater flows into an aeration basin. Currently the aerators are run as 30 minute on/off cycles to maintain a dissolved oxygen level of between 1.0 mg/L to 1.2 mg/L. During the off-season the operator indicated that he typically adds one 40 pound bag of dog food per week to the aeration basin as a supplemental food source. From the aeration basin, wastewater flows into a circular 7,600 gallon clarifier. There is one air lift pump for sludge transfer. Sludge is stored in a 9,300 gallon sludge holding tank. Sludge from the system is periodically hauled to the Pepper Ferry Regional Wastewater Treatment Plant. The effluent from the clarifier flows through two tablet chlorinators.

Storage and Irrigation

The final chlorinated effluent is pumped to a covered 3 million gallon concrete tank. The tank has an oxygenator installed at the top of the tank. Effluent is pumped from the bottom of the tank through the oxygenator by the spray irrigation pumps. The tank is 36 feet deep, and at the time of the site visit, the water level was 14 feet. The tank

level is monitored on two strip chart recorders located in the treatment plant lab. One recorder measures more precisely from the 35 to 36 foot mark, so the head on the overflow pipe can be recorded to allow computation of any overflow volume. The tank has a reserve capacity of 10 days with a 13 percent factor of safety over worst case storage needs. The storage tank has been sized to store all wastewater projected to be generated during a severe winter (4 months).

Effluent from the storage tank is pumped to spray fields that are located approximately 3,000 feet northwest of the hotel, and approximately 1,000 feet west of the storage facilities. The fields are located in mature forest with slopes ranging from 4 to 12 percent.

The irrigation system consists of piping and spray nozzles to convey and distribute the treated wastewater in the forest. The effluent is cleaned through microorganisms in the soil and uptake of nutrients in the vegetation. The spray irrigation area system covers 16 forested acres which is subdivided into one-acre fields each with six sprinkler head. Currently 12 fields are being used. Field numbers 10, 11, 15, and 16 are not dosed. During the months of June through August the permittee currently doses on Monday, Wednesday, and Friday. The system has a precipitation sensor shutoff. The typical operation scenario is to dose each field every other day for 45 minutes at an approximate rate of 47 gpm. This operation ensures that the hydraulic limitations expressed in the permit are maintained. At the time of the site visit, three of the fields were observed, and no obvious unfavorable effects were evident.

Attachment C

Effluent Data and Calculations

- **Effluent Data (before storage)**
- **Effluent Data (after storage)**
- **Excerpt from EPA Process Design Manual of Land Treatment of Municipal Wastewater Effluent (2006)**

Mountain Lake Hotel (VPA02058)

Effluent Treatment Plant Monitoring

Date	Flow (MGD)		BOD_5 (mg/L)		TSS		pH (S.U.)		TRC (mg/L)
	max	ave	max	ave	max (mg/L)	max (kg/d)	min	max	min
Jan-12	0.042	0.02	<QL	<QL	<QL	<QL	6.5	6.9	2.0
Dec-11	0.026	0.013	<QL	<QL	<QL	<QL	6.5	6.8	2.2
Nov-11	0.029	0.017	<QL	<QL	<QL	<QL	6.5	6.8	2.4
Oct-11	0.03	0.015	<QL	<QL	<QL	<QL	6.5	6.8	2.2
Sep-11	0.026	0.014	<QL	<QL	5	0.2	6.5	6.8	2.2
Aug-11	0.027	0.016	<QL	<QL	<QL	<QL	6.6	6.9	2.4
Jul-11	0.098	0.0175	<QL	<QL	1.0	0.03	6.5	6.9	2.0
Jun-11	0.028	0.014	<QL	<QL	<QL	<QL	6.5	7.1	2.2
May-11	0.027	0.017	<QL	<QL	<QL	<QL	6.5	7.1	2.0
Apr-11	0.026	0.0165	<QL	<QL	6	0.1	6.5	6.9	2.0
Mar-11	0.027	0.017	<QL	<QL	<QL	<QL	6.5	7.0	2.2
Feb-11	0.024	0.014	<QL	<QL	<QL	<QL	6.5	6.9	2.2
Jan-11	0.025	0.012	<QL	<QL	<QL	<QL	6.3	6.6	2.2
Dec-10	0.027	0.013	<QL	<QL	<QL	<QL	6.4	6.9	2.0
Nov-10	0.024	0.015	<QL	<QL	<QL	<QL	6.5	6.9	2.0
Oct-10	0.027	0.0138	<QL	<QL	<QL	<QL	6.6	6.9	2.2
Sep-10	0.025	0.0139	<QL	<QL	<QL	0.2	6.6	6.9	2.0
Aug-10	0.027	0.017	<QL	<QL	3.0	<QL	6.4	6.9	2.0
Jul-10	0.033	0.018	<QL	<QL	<QL	<QL	6.5	7.0	2.2
Jun-10	0.035	0.0199	<QL	<QL	1.0	0.01	6.5	6.9	2.2
May-10	0.028	0.0166	<QL	<QL	<QL	<QL	6.6	6.9	2.0
Apr-10	0.029	0.0173	<QL	<QL	1.0	0.1	6.5	6.9	2.2
Mar-10	0.017	0.0078	<QL	<QL	<QL	<QL	6.5	6.9	2.0
Feb-10	0.017	0.012	<QL	<QL	<QL	<QL	6.4	6.9	2.0
Jan-10	0.015	0.0076	<QL	<QL	<QL	<QL	6.5	7.0	2.0
Dec-09	0.020	0.007	<QL	<QL	<QL	<QL	6.3	6.8	2.0
Nov-09	0.029	0.0123	<QL	<QL	<QL	<QL	6.5	7.1	2.2
Oct-09	0.025	0.0137	<QL	<QL	<QL	<QL	6.1	6.8	2.2
Sep-09	0.019	0.010	<QL	<QL	<QL	<QL	6.5	7.1	2.2
Aug-09	0.039	0.012	<QL	<QL	<QL	<QL	6.5	7.0	2.2
Jul-09	0.030	0.0165	<QL	<QL	4.0	0.2	6.5	7.2	2.2
Jun-09	0.041	0.0215	<QL	<QL	5.0	0.2	6.5	6.9	2.0
May-09	0.071	0.0226	<QL	<QL	<QL	<QL	6.3	6.9	2.0
Apr-09	0.024	0.012	<QL	<QL	<QL	<QL	6.4	7.2	2.0
Feb-09	0.034	0.0171	3.0	3.0	<QL	<QL	6.4	6.9	2.2
Dec-08	0.034	0.011	<QL	<QL	<QL	<QL	6.5	6.9	2.0
Nov-08	0.025	0.0116	<QL	<QL	<QL	<QL	6.5	6.9	2.0

Mountain Lake Hotel (VPA02058)

Effluent Monitoring (After Storage)

Month - Year	Volume from storage	hourly max ap rate	weekly max ap rate	total volume to each site	BOD	pH	fecal coliform	TKN	ammonia N	nitrate N	total N	total P	total K
	MG	inches	inches	gals/month	mg/L	S.U.	N/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aug-11	1.2831	0.10	0.78	91650	<QL	6.26	<QL	<QL	<QL	0.56	0.4		
Jul-11	1.2831	0.10	0.78	91650	<QL	6.19	<QL	<QL	<QL	0.51	1.35		
Jun-11	1.2831	0.10	0.78	91650	<QL	7.21	<QL	<QL	<QL	1.24	0.96		
Aug-10	1.2831	0.10	0.78	91650	<QL	7.46	<QL	<QL	<QL	1.09	4.5		
Jul-10	2831	0.10	0.78	91650	<QL	7.38	<QL	3.6	<QL	1.2	3.7	0.37	0.961
Aug-09	1.2831	0.10	0.78	91650	<QL	7.67	<QL	<QL	<QL	1.77	1.4		
Jul-09	1.3818	0.10	0.78	98700	<QL	6.97	<QL	2.2	<QL	0.34	2.1	0.35	<QL
Oct-08	1.2831	0.10	0.78	91650	<QL	7.46	--	2.1					
Jul-08	1.2831	0.10	0.78	91650	<QL	6.93	<QL	1	<QL	0.40	1.6	0.11	<QL
Jun-08	1.2831	0.10	0.78	91650	<QL	7.46	--	2.1	<QL	0.47	0.5		
Sep-07	0.7896	0.10	0.78	56400	<QL	6.71	<QL	<QL	<QL	0.38	1.1	<QL	<QL
Aug-07	1.3818	0.10	0.78	98700	<QL	7.65	<QL	<QL	<QL	0.33	0.8	<QL	<QL
Jul-07	1.2831	0.10	0.78	91650	<QL	6.91	<QL	<QL	<QL	0.47	0.5	<QL	<QL
Jun-07	1.2831	0.10	0.78	91650	11.0	6.76	<QL	<QL	<QL	0.47	0.4	<QL	<QL
Sep-06	0.9138	0.10	0.83	71950	<QL	6.43	<QL	<QL	<QL	0.475	2.1		
Aug-06	1.2831	0.10	0.78	91650	<QL	6.61	<QL	<QL	<QL	0.545	1.8	<QL	<QL
Jul-06	0.8883	0.10	0.78	63450	<QL	6.17	<QL	<QL	<QL	0.518	1.14		
Jun-06	1.3818	0.10	0.78	98700	<QL	6.14	<QL	<QL	<QL	1.30	1.1		
Sep-05	0.9306	0.10	0.78	70500	<QL	6.43	<QL	<QL	<QL	0.47	0.3		
Aug-05	1.2831	0.10	0.78	91650	<QL	6.56	<QL	<QL	<QL	0.649	0.5	<QL	<QL
Jul-05	1.3818	0.10	0.78	98700	<QL	6.7	<QL	0.58	<QL	0.552	0.9	0.022	<QL
Jun-05	0.7402	0.10	0.78	56400	<QL	6.67	<QL	<QL	<QL	0.5	0.2		
May-05	0.564	0.10	0.78	42300	<QL	6.93	<QL	<QL	<QL	0.6	0.6	<QL	<QL

Mountain Lake Hotel (VPA02058)

Month	Volume in Storage (MG)	Remaining Storage Capacity (MG)
Jan-12	1.500	1.5
Dec-11	1.100	1.900
Nov-11	0.800	2.200
Oct-11	0.500	2.500
Sep-11	0.15	2.85
Aug-11	0.400	2.600
Jul-11	1.150	1.850
Jun-11	1.900	1.100
May-11	2.750	0.250
Apr-11	2.350	0.650
Mar-11	2.00	1.00
Feb-11	1.600	1.400
Jan-11	1.300	1.700
Dec-10	1.000	2.000
Nov-10	0.35	2.65
Oct-10	0.75	2.25
Sep-10	0.08	2.92
Aug-10	0.55	2.45
Jul-10	1.30	1.70
Jun-10	2.05	0.950
May-10	2.7500	0.2500
Apr-10	2.55	0.45
Mar-10	2.250	0.750
Feb-10	2.0000	1.0000
Jan-10	1.7000	1.3000
Dec-09	1.500	1.500
Nov-09	1.2872	1.7128
Oct-09	0.8182	2.1818
Sep-09	0.5400	2.4600
Aug-09	0.2738	2.7262
Jul-09	1.0992	1.9008
Jun-09	2.0000	1.0000
May-09	2.8000	0.2000
Apr-09	2.6500	0.3500
Feb-09	2.2000	0.8000
Dec-08	1.5000	1.5000
Nov-08	1.2730	1.7270

Mountain Lake Hotel (VPA02058)

Effluent Storage Tank Pump Station (Composite)
(1/ 5 Years)

Date	Total Cd	Total Cu	Total Pb	Total Ni	Total Zn
	mg/L	mg/L	mg/L	mg/L	mg/L
ground water standard	**0.0004**	**1.0**	**0.05**		**0.05**
recommended limits*	**0.010**	**0.020**	**5.0**	**0.20**	**2.0**
9/26/07	<QL	0.0374	<QL	<QL	0.0406

*Rowe, D.R. and I.M. Abel-Magig, (1995) Handbook of Wastewater Reclamation and Reuse CRC Press, Inc., 550 pp (limits recommended for reclaimed water for irrigation) Recommended limits table found in Process Design Manual for Land Treatment of Municipal Wastewater, EPA/625/R-06/016, 2006

- Copper
- Iron
- Manganese
- Molybdenum
- Nickel
- Zinc

2.6.2 Metals

The major concern with respect to metals is the potential for accumulation in the soil profile and then subsequent translocation, via crops or animals, through the food chain to man. The metals of greatest concern are cadmium (Cd), lead (Pb), mercury (Hg), and arsenic (As). The concentrations of metals that can be safely applied to crops are presented in Table 2-6. Most crops do not accumulate lead but there is some concern with respect to ingestion by animals grazing on forages or soil to which biosolids have been applied. In general, zinc, copper, and nickel will be toxic to the crop before their concentration in plant tissues reaches a level that poses a significant risk to human or animal health. Cadmium is the greatest concern because the concentration of concern for human health is far below the level that could produce toxic effects in the plants. WHO has published guidelines for annual and cumulative metal additions (based on US EPA's Part 503 rule) to agricultural crop land (Chang et al., 1995). Adverse effects should not be expected at these loading rates. These loading rates are presented in Table 2-7. Although they were developed for biosolids applications, it is prudent to apply the same criteria for wastewater applications.

2.6.3 Metals Removal in Crops and Soils

It is not possible to predict the total renovative capacity of a land treatment site with simple ion exchange or soil adsorption theories. Although the metals are accumulated in the soil profile, the accumulation resulting from repeated applications of wastewater does not seem to be continuously available for crop uptake. Work by several investigators with biosolids demonstrates that the metals uptake in a given year is more dependent on the concentration of metals in the biosolids most recently applied and not on the total accumulation of metals in the soil.

The capability of metal uptake varies with the type of crop grown. Swiss chard, and other leafy vegetables take up more metals than other types of vegetation. Metals tend to accumulate in the liver and kidney tissue of animals grazing on a land treatment site or if fed harvested products. Tests done on a mixed group of 60 Hereford and Angus steers that graze directly on the pasture grasses at the Melbourne, Australia land treatment site (untreated raw sewage applied) showed that "the concentrations of cadmium, zinc and nickel found in the liver and kidney tissues of this group are within the expected normal range of mammalian tissue." (Anderson, 1976). Anthony (1978) has reported on metals in bone, kidney and liver tissue in mice and rabbits which were indigenous to the Pennsylvania State University land treatment site and no adverse impacts were noted.

The average metal concentrations in the shallow groundwater beneath the Hollister, CA, rapid infiltration site are shown in Table 2-8. After 33 years of operation

Table 2-6. Recommended Limits for Constituents in Reclaimed Water for Irrigation (Rowe, D.R. and I. M. Abel-Magid, 1995)

Element	For waters used continuously on all soil, mg/L	For use up to 20 years on fine-textured soils of pH 6.0 to 8.5, mg/L
Aluminum	5.0	20.0
Arsenic	0.10	2.0
Beryllium	0.10	0.50
Boron	0.75	2.0-10.0
Cadmium	0.010	0.050
Chromium	0.10	1.0
Cobalt	0.050	5.0
Copper	0.20	5.0
Fluoride	1.0	15.0
Iron	5.0	20.0
Lead	5.0	10.0
Lithium	2.5[a]	2.5[a]
Manganese	0.20	10.0
Molybdenum	0.010	0.050[b]
Nickel	0.20	2.0
Selenium	0.020	0.020
Zinc	2.0	10.0

[a]Recommended maximum concentration for irrigating citrus is 0.075 mg/L.
[b]For only acid fine-textured soils or acid soils with relatively high iron oxide contents.

Table 2-7. WHO Recommended Annual and Cumulative Limits for Metals Applied to Agricultural Crop Land (Chang et al., 1995)

Metal	Annual loading rate[a] (kg/ha[c])	Cumulative loading rate[a] (kg/ha[c])
Arsenic	2.0	41
Cadmium	1.9	39
Chromium	150	3,000
Copper	75	1,500
Lead	15	300
Mercury	0.85	17
Molybdenum	0.90	18
Nickel	21.0	420
Selenium	5.0	100
Zinc	140	2,800

[a]Loading kg/ha per 365 day period.
[b]Cumulative loading over lifetime of site.
[c]kg/ha x 0.89 = lb/ac.

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Table 2-17. Percent Removal of Organic Chemicals in Land Treatment Systems (Reed et al., 1995)

Substance	SR		OF	SAT
	Sandy soil	Silty soil		
Chloroform	98.57	99.23	96.50	>99.99
Benzene	>99.99	>99.99	99.00	99.99
Toluene	>99.99	>99.99	98.00	>99.99
Chlorobenzene	99.97	99.96	96.99	>99.99
Bromoform	99.93	99.96	97.43	>99.99
Dibromochloromethane	99.72	99.72	95.78	>99.99
m-nitrotoluene	>99.99	>99.99	94.03	a
PCB 1242	>99.99	>99.99	99.46	>99.99
Naphtalene	99.96	99.96	96.49	96.15
Phenanthrene	>99.99	>99.99	99.19	a
PentaChlorophenol	>99.99	>99.99	96.06	a
2,4-Dinitrophenol	a	a	93.41	a
Nitrobenzene	>99.99	>99.99	88.73	a
m-Dichlorobenzene	>99.99	>99.99	a	82.27
Pentane	>99.99	>99.99	a	a
Hexane	99.96	99.96	a	a
Diethylphthalate	a	a	a	99.75

a Not reported.

Poplar trees have emerged as the most widely used species. These trees grow faster than other northern temperate zone trees, they have high rates of water and nutrient uptake, they are easy to propagate and establish from stem cuttings, and the large number of species varieties permit successful use at a variety of different site conditions. Cottonwood, willow, tulip, eucalyptus, and fir trees have also been used. Wang, et al., for example, have demonstrated the successful removal by hybrid poplar trees (H11-11) of carbon tetrachloride (15 mg/L in solution) (Wang et al., 1999). The plant degrades and dechlorinates the carbon tetrachloride and releases the chloride ions to the soil and carbon dioxide to the atmosphere.

Indian mustard and maize have been studied for the removal of metals from contaminated soils (Lombi et al., 2001). Alfalfa has been used to remediate a fertilizer spill (Russelle et al., 2001).

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Attachment D

Ground Water Monitoring

- **Ground Water Monitoring Plan**
- **Ground Water Data**

GROUNDWATER MONITORING PLAN SUMMARY
Mountain Lake Spray Irrigation System

BACKGROUND CONDITIONS

Geology

The area around Mountain Lake is a breached inlier, that is older rocks surrounded by younger rocks in normal stratigraphic sequence. The youngest rocks exposed in the proposed area are sandstones of Silurian Age (Tonoloway and Keefer Fm.) underlain by the Rose Hill Fm, (Srh); the Tuscarora Fm. (St); the Juniata Fm (Oj) and the Martinsburg and Reedsville (Fms) of Ordovician Age.

The south end of the lake is underlain by the Martinsburg and Juniata Fms. while the north end is underlain by the Tuscarora and Rose Hill Fms. The south end has been breached by erosion of Doe creek during a past geologic east at about 14 degrees. There are no known faults in the general area. Hemlock Branch appears to be a minor shear or fracture filled with colluvium (mainly Rose Hill sandstone).

Weathering is deep as the sandstones have been leached of a great deal of their cementing material. From the appearance of many of the test pits, the soil is quite sandy and mixed with organic material. Bedrock is exposed at the surface especially on the ridge line along the road to the golf course. Some outcrops can be seen around the hotel. The structure at Mountain Lake is synclinal.

Hydrogeolgy

Seasonal water table does not appear to exist in the shallow soil profiles (three to seven feet below the soil surface) of the site. Depth to the water table at the application site is in the order of 30 to 40 feet below the soil surface and appears to be locally controlled by topographic and geologic features. The direction of groundwater flow is thought to correspond to topographic relief. Water movement is in the direction of surface topography. Measurement of groundwater elevations during routine monitoring appears to confirm this assumption. The gradient appears to be dipping to the north at slope of about 10 percent. The average surface slope in this area is about 13 percent. No groundwater dye test or pumping analysis have been conducted. A groundwater mounding analysis was performed by Dr. Daniel Fritton of the Pennsylvania State University, prior to design and was included in the Preliminary Engineering Report previously reviewed by the VWCB.

MONITORING

Sites

Groundwater is presently being monitored at four sites:

Site 1: Depth: 100 feet Upgradient monitoring well south of spray field.
State Plane Coordinates: N 380424.71, E 1404766.10
Top of Casing Elevation: 4171.02 feet
Groundwater Elevation (June 1991): 4139 feet
Sampled by permanently set bladder pump
Formerly designated U-1

Site 2: Upgradient spring southeast of spray field.
State Plane Coordinates: N 380300, E 1405861
Elevation at sample point: 4062 +/- feet
Groundwater Elevation (June 1991): 4062 feet
Sampled by direct collection
Formerly designated U-2

Site 3: Downgradient spring north of spray field
State Plane Coordinates: N 382616, E 1405121
Elevation at sample point: 3936 +/- feet
Groundwater Elevation (June 1991): 3936 +/- feet
Sampled by direct collection
Formerly designated D-1

Site 4: Downgradient monitoring well northwest of spray field.
Depth: 7 feet
State Plane Coordinates: N 382809, E 1439775 (approx.)
Top of Casing Elevation: 3869 +/- feet
Groundwater Elevation (June 1991): 3863 feet
Sampled by bailer
Formerly designated D-2

Surface water is presently being monitored at one site:

Site 7: Pond Drain, below spray field in the vicinity of the Mountain Lake property line.

Periodic sampling has been conducted at other sites both prior to and since the spray irrigation system began operation. Most of this sampling and analysis was conducted by the Departments of Biology and Forestry at Virginia Tech. This sampling included the following sites:

Site 5: Treated effluent from the sample tap at the irrigation pump station.

Site 6: Pond Drain at the discharge of Mountain Lake near the Lake House.

Site 8: Tributary to Pond Drain located at an H-flume installed approximately 300 feet downstream of Site 3.

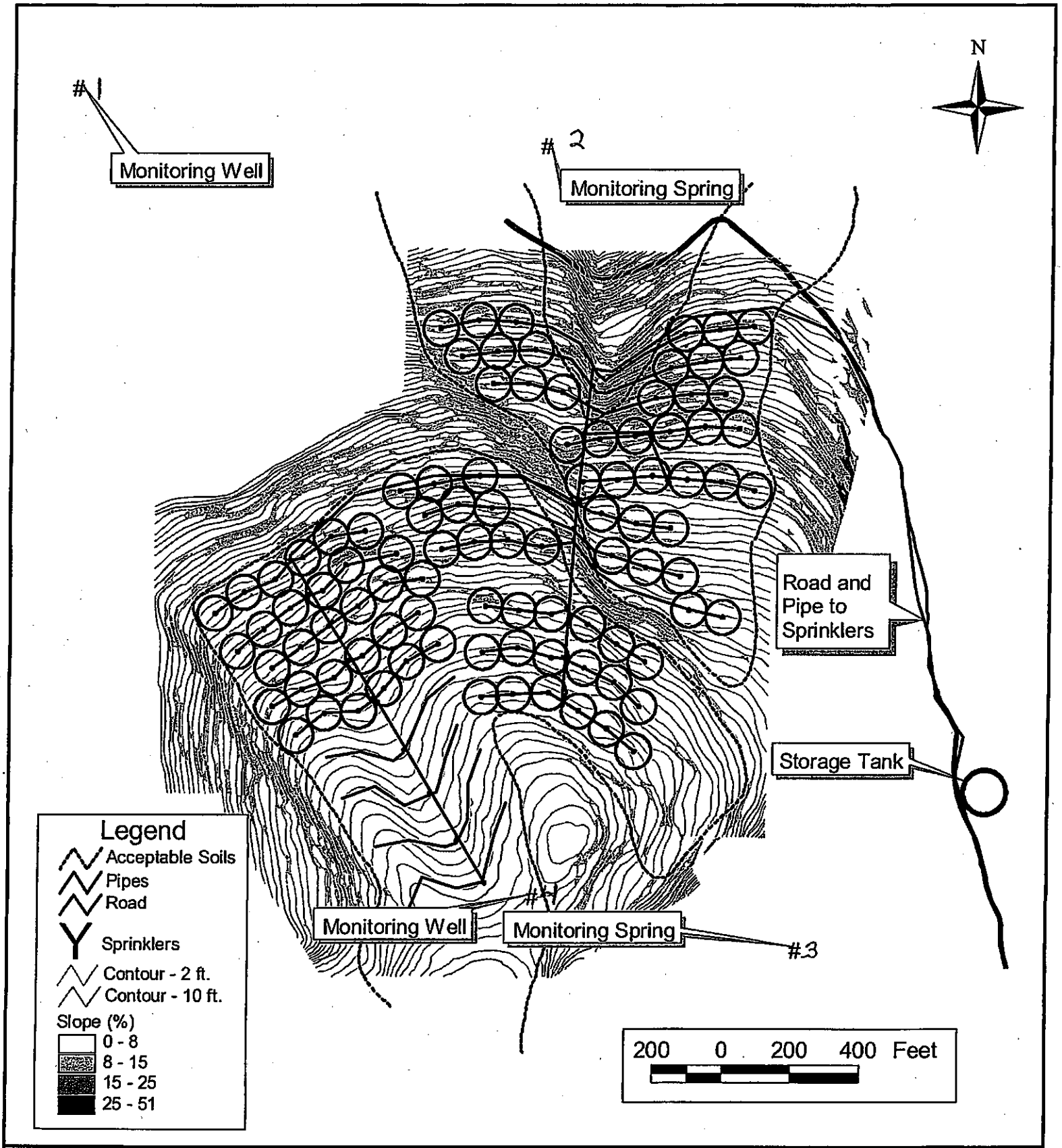
Parameters

Groundwater is sampled quarterly at Sites 1, 2, 3, and 4 by Mountain Lake personnel. Samples are analyzed by a commercial laboratory (presently Olver, Inc. of Blacksburg). The following parameters are analyzed and reported on the monthly No-Discharge Certificate Monitoring Report:

Groundwater Elevation
pH
Ammonia (as N)
Nitrates (as N)
Chemical Oxygen Demand
Total Coliform
Chlorides
Specific Conductance

Surface water is sampled twice per year, typically spring and fall at Site 7 by Mountain Lake personnel. Samples are analyzed by a commercial laboratory for the following parameters

pH
Ammonia (as N)
Nitrates (as N)
Chlorides



Site Plan of Spray Irrigation Mountain Lake, Virginia

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MOUNTAIN LAKE

Site No. 1

upgradient well (100 feet from south of spray field)
TOC = 4171.02 ft, GWE = 4139 ft (June 1991)

Well	Date	SWL	Chlorides	Cond.	Nitrate Nitrogen	pH	TOC	Alkalinity	fecal coliform	Hardness	Ammonia	TKN	P
		ft	mg/L	mmhos/cm	mg/L	S.U.	mg/L	mg/L	N/100 mL	mg/L	mg/L	mg/L	mg/L
WQS			25		5	6-9	10	30-500		300	0.025		
QL required by GWMP													
1	Dec-11	85.15	<QL	292	<QL	5.6							
1	Aug-11	85.50	<QL	307	<QL	5.44							
1	Mar-11	84.75	<QL	27.6	<QL	6.02							
1	Dec-10	84.95	0.4	277	<QL	5.64							
1	Sep-10	85.19	ND	306	ND	5.09							
1	Mar-10	84.20	1.67	2.80	<QL	5.73							
1	Dec-09	85.00	<QL	2.60	<QL	6.63							
1	Sep-09	86.10	<QL	2.60	0.18	6.20							
1	Jun-09	84.36	<QL	26.4	0.18	6.53							
1	Dec-08	85.00	<QL	260	<QL	6.63							
1	Sep-08	84.80	<QL	270	<QL	6.65							
1	Jun-08	84.78	<QL	262	<QL	6.47							
1	Mar-08	84.51	<QL	263	<QL	6.81							
1	Dec-07	84.46	<QL	268	<QL	6.69							
1	Sep-07	NA	28.1	254	0.88	6.76							
1	Jun-07	dry											
1	Mar-07	dry											
1	Dec-06	83.28	5.3	139	<QL	7.08	<QL	100	<QL	128	0.1	<QL	0.297
1	Sep-06	83.39	<QL	215	<QL	6.15							
1	Jun-06	82.81	1.67	108.0	0.106	6.99							
1	Mar-06	82.40	1.3	218.0	<QL	10.40							
1	Dec-05	82.90	<QL	140	<QL	7.33							
1	Sep-05	82.00	<QL	150	<QL	6.96	<QL	108	<QL	128	<QL	<QL	0.12
1	Jun-05	82.06	<QL	148	0.2	6.72							
1	Jun-04	81.68	2	220	0.1	7.14							
1	May-04	81.78	1	230	<QL	7.08							
1	Mar-03	7.57	2	270	0.2	6.9	0.6	122	<QL	166	0.1	<QL	<QL

Site No. 2

upgradient spring (southeast of spray field)
Elevation 4062 ft, GWE = 4062 ft (June 1991)

Well	Date	SWL	Chlorides	Cond.	Nitrate Nitrogen	pH	TOC	Alkalinity	fecal coliform	Hardness	Ammonia	TKN	P
		ft	mg/L	mmhos/cm	mg/L	S.U.	mg/L	mg/L	N/100 mL	mg/L	mg/L	mg/L	mg/L
WQS			25		5	6-9							
QL required by GWMP													
2	Dec-11	2.6	<QL	8.01	<QL	5.1							
2	Aug-11	NA	NA	NA	NA	NA							
2	Mar-11	NA	<QL	21.1	<QL	7.02							
2	Dec-10	NA	0.43	15.28	0.04	6.99							
2	Mar-10	NA	<QL	19.12	<QL	5.79							
2	Dec-09	NA	<QL	8.67	<QL	6.4							
2	Sep-09	NA	<QL	14.47	<QL	6.88							
2	Jun-09	NA	<QL	18.83	<QL	6.95							
2	Dec-08	NA	2.68	8.67	0.11	6.4							
2	Sep-08	NA	<QL	13.98	<QL	6.39							
2	Jun-08	NA	<QL	16.6	<QL	6.75							
2	Mar-08	NA	<QL	24.6	<QL	5.31							
2	Dec-07	NA	<QL	20.5	<QL	5							
2	Sep-07	dry											
2	Jun-07	NA	18.3	19.6	0.4	4.86							
2	Mar-07	NA	<QL	17.2	0.2	5.00	1.57	2	1	2.93	<QL	<QL	<QL
2	Dec-06	NA	<QL	14.1	0.169	7.25	1.52	<QL	<QL	<QL	<QL	<QL	<QL
2	Sep-06	NA	<QL	16.1	<QL	6.50							
2	Jun-06	NA	1.69	17.7	0.269	5.70							
2	Mar-06	NA	1.27	19.0	0.297	4.68							
2	Dec-05	NA	<QL	15.6	0.419	8.03							
2	Sep-05	NA	<QL	18	0.843	4.63	2.9	<QL	13	6	<QL	<QL	<QL
2	Jun-05	NA	1	19.8	0.3	4.61							
2	Jun-04	NA	2	20	0.2	5.14							
2	May-04	NA	1	20	0.3	5.08							
2	Mar-03	NA	2	21.9	0.2	4.9	1.3	<QL	<QL	14	0.3	<QL	0.4

Site No. 3 — downgradient spring (north of spray field)
Elevation 4062 ft, GWE = 4062 ft (June 1991)

Well	Date	SWL	Chlorides	Cond.	Nitrate Nitrogen	pH	TOC	Alkalinity	fecal coliform	Hardness	Ammonia	TKN	P
		ft	mg/L	mmhos/cm	mg/L	S.U.	mg/L	mg/L	N/100 mL	mg/L	mg/L	mg/L	mg/L
WQS			25		5	6-9	10	30-500		300	0.025		
QL required by GWMP													
3	Dec-11	NA	1.62	22.6	0.59	5.4							
3	Aug-11	NA	10.2	97	3.9	6.02							
3	Mar-11	NA	1.06	20.9	0.60	6.85							
3	Dec-10	NA	1.4	24.3	0.56	6.56							
3	Sep-10	NA	2.2	26.2	ND	5.69							
3	Mar-10	NA	<QL	24.0	0.40	5.03							
3	Dec-09	NA	1.63	44.9	0.54	5.67							
3	Sep-09	site was dry											
3	Jun-09	NA	7.2	70.3	1.7	6.12							
3	Dec-08	NA	3.6	44.9	1.44	5.67							
3	Sep-08	NA	22.6	176.4	10.1	6.21							
3	Jun-08	NA	15.0	124.2	5.88	5.69							
3	Mar-08	NA	1.54	25.7	0.62	5.52							
3	Dec-07	NA	2.91	37.9	<QL	5.15							
3	Sep-07	dry											
3	Jun-07	NA	0.40	56.7	0.09	4.74							
3	Mar-07	NA	4.11	40.0	1.49	5.50	0.94	2.4	1	3.81	<QL	<QL	<QL
3	Dec-06	NA	3.08	20.1	1.11	6.43	1.43	<QL	<QL	12	<QL	<QL	0.057
3	Sep-06	NA	6.57	53.0	1.78	6.37							
3	Jun-06	NA	10.6	73.8	5.00	5.72							
3	Mar-06	NA	2.48	28.9	0.977	5.10							
3	Dec-05	NA	1.68	20.5	0.904	7.70							
3	Sep-05	NA	14.9	100	6.85	5.28	1.3	3.0	80	12	<QL	<QL	0.143
3	Jun-05	NA	10	57	3.8	4.46							
3	Jun-04	NA	5	40	1.2	5.71							
3	May-04	NA	2	25	0.6	4.71							
3	Mar-03	NA	3	21.5	0.5	5.10	0.68	<QL	<QL	12	<QL	<QL	0.3

Site No. 4 — downgradient well (northwest of spray field)
TOC = 3869 ft, GWE = 3863 ft (June 1991)

Well	Date	SWL	Chlorides	Cond.	Nitrate Nitrogen	pH	TOC	Alkalinity	fecal coliform	Hardness	Ammonia	TKN	P
		ft	mg/L	mmhos/cm	mg/L	S.U.	mg/L	mg/L	N/100 mL	mg/L	mg/L	mg/L	mg/L
WQS			25		5	6-9	10						
QL required by GWMP													
4	Dec-11	2.60	<QL	8.01	<QL	5.1							
4	Aug-11	10.93	NA	8.92	NA	5.12							
4	Mar-11	3.70	<QL	7.56	0.10	5.17							
4	Dec-10	5.60	0.52	9.03	0.09	5.11							
4	Sep-10	10.47	ND	10.56	ND	5.21							
4	Mar-10	2.80	<QL	8.56	<QL	5.00							
4	Dec-09	2.68	<QL	8.49	0.10	5.20							
4	Sep-09	7.34	<QL	9.62	<QL	4.73							
4	Jun-09	5.10	<QL	9.35	0.21	4.75							
4	Dec-08	7.90	<QL	9.11	0.1	4.87							
4	Sep-08	11.30	<QL	10.58	<QL	4.73							
4	Jun-08	6.50	<QL	8.4	0.12	4.9							
4	Mar-08	3.40	<QL	8.19	0.11	4.87							
4	Dec-07	2.71	<QL	11.1	<QL	4.85							
4	Sep-07	dry											
4	Jun-07	NA	5.79	10.1	1.790	4.21							
4	Mar-07	NA	<QL	7.6	0.150	4.28	1.65	<QL	<QL	<QL	<QL	<QL	1.36
4	Dec-06	5.45	<QL	7.4	0.183	5.10	2.97	<QL	<QL	<QL	<QL	<QL	6.14
4	Sep-06	5.96	<QL	8.7	0.134	4.88							
4	Jun-06	5.51	1.86	9.5	0.212	5.32							
4	Mar-06	5.2	1.40	9.6	0.190	4.79							
4	Dec-05	1.90	<QL	7.9	<QL	6.92							
4	Sep-05	10.00	<QL	9.4	0.216	4.74	3.5	1.0	<QL	<QL	<QL	0.71	0.121
4	Jun-05	6.31	1	6.8	0.3	4.88							
4	Jun-04	5.55	2	10	0.2	5.27							
4	May-04	5.05	1	10	0.2	4.69							
4	Mar-03	8.85	3	10.1	0.5	6.7	<QL	QL	<QL	14	<QL	<QL	<QL

Attachment E

Land Application Site Information

- Land Application Data
- Nitrogen Loading Calculations

Mountain Lake Hotel (VPA02058)

Land Application Report

Month Year	Effluent vol applied gal/acre	effluent vol applied in/mo/site	effluent total N applied (lb/acre)	other nitrogen applied (lb/acre)	total N applied ytd lb/acre
Sites 1,2,3,4,5,6,7,8,9,12,13,14,15,16					
Aug-11	91650	3.38	0.4		1.75
Jul-11	91650	3.38	0.39		1.35
Jun-11	91650	3.38	0.96		0.96
Aug-10	91650	3.38	0.8		4.5
Jul-10	91650	3.38	3.7		3.7
Aug-09	91650	3.38	1.4		3.5
Jul-09	98700	3.68	2.1		2.1
Jul-08	91650	3.38	1.1		1.6
Jun-08	91650	3.38	0.5		0.5
Sep-07	56400	2.08	0.2		1.1
Aug-07	98700	3.64	0.3		0.8
Jul-07	91650	3.38	0.4		0.5
Jun-07	91650	3.38	0.4		0.4
Sites 1,2,3					
Sep-06	71950	2.65	0.3		2.1
Sites 4,5,6,7,8,9,12,13,14					
Sep-06	63450	2.34	0.3		2.1
Sites 1,2,3,4,5,6,7,8,9,12,13,14,15,16					
Aug-06	91650	3.38	0.4		1.8
Jul-06	63450	2.34	0.3		1.4
Jun-06	98700	3.64	1.1		1.1
Sites 1,2,3,4,5,6					
Sep-05	70500	2.60	0.3		2.5
Sites 7,8,9,12,13,14					
Sep-05	65450	2.34	0.2		2.3
Aug-05	91650	3.38	0.5		2.1
Sites 1,2,3,4,5,6,7,8,9,14					
Jul-05	98700	3.64	0.9		1.7
Sites 12,13					
Jul-05	98700	3.64	0.9		1.6
Sites 1,2,3					
Jun-05	56400	2.08	0.2		0.8
Sites 4,5,6,7,7,8,9,14					
Jun-05	49350	1.82	0.2		0.8
Sites 12,13					
Jun-05	56400	2.08	0.2		0.7
Sites 1,2,3,4,5,6,7,8,9,14					
May-05	42300	1.56	0.6		0.6
Sites 12,13					
May-05	35250	1.30	0.5		0.45

DESIGN VALUES

FOREST SPRAY IRRIGATION SYSTEM - HYDRAULIC STORAGE DESIGN
Mountain Lake Wastewater Project J.N. 4837

VARIABLES:

Qd	Average Daily Design Flow (gpd)
Qm	Monthly Accumulated Wastewater (gal)
Ld	Design Wastewater Loading (in/acre month)
Lm	Design Wastewater Volume Applied (gal/month)
Pr	Precipitation (in/month)
ET	Evapotransporation (in/month)
Sm	Change in Stored Wastewater Volume (gal/month)
Sb	Stored Wastewater Balance (gal)
A	Active Application Area (acres)..... 12.0

CALCULATIONS:

Ld is derived from WASTEWATER LOADING RATE DESIGN

$Sm = Qm - Lm + ((Pr - ET) * 27200)$

Month	Qd gpd	Qm gal/mo	Ld in/mo	Lm gal/mo	Pr in/mo	ET in/mo	Sm gal	Sb gal
JAN	21400	663400	0.0	0			663400	663400
FEB	21400	599200	0.0	0			599200	1262600
MAR	16400	508400	2.3	750720			-242320	1020280
APR	18500	555000	2.5	816000			-261000	759280
MAY	19500	604500	3.2	1044480			-439980	319300
JUN	25500	765000	3.7	1207680			-442680	0
JUL	31500	976500	4.0	1305600			-329100	0
AUG	31500	976500	3.7	1207680			-231180	0
SEP	23500	705000	3.2	1044480			-339480	0
OCT	26700	827700	2.3	750720			76980	76980
NOV	20600	618000	1.8	587520			30480	107460
DEC	26700	827700	0.0	0			827700	935160
ANNUAL	23600	8626900	26.7	8714880	0	0	-87980	
JAN	21400	663400	0.0	0			663400	1598560
FEB	21400	599200	0.0	0			599200	2197760
MAR	16400	508400	2.3	750720			-242320	1955440
APR	18500	555000	2.5	816000			-261000	1694440
MAY	19500	604500	3.2	1044480			-439980	1254460
JUN	25500	765000	3.7	1207680			-442680	811780
JUL	31500	976500	4.0	1305600			-329100	482680
AUG	31500	976500	3.7	1207680			-231180	251500
SEP	23500	705000	3.2	1044480			-339480	0
OCT	26700	827700	2.3	750720			76980	76980
NOV	20600	618000	1.8	587520			30480	107460
DEC	26700	827700	0.0	0			827700	935160
ANNUAL	23600	8626900	26.7	8714880	0	0	-87980	

DESIGN VALUES

FOREST SPRAY IRRIGATION SYSTEM - WASTEWATER LOADING RATE DESIGN
Mountain Lake Wastewater Project J.N.4837

VARIABLES:

Pr	Precipitation Percolating into Soil (in/month)	
r	Runoff Fraction of Precipitation.....	0.0
ET	Evapotranspiration (in/month)	
Pm	Measured Percolation Rate (min/in).....	45.0
Pw	Design Percolation Rate (in/day)	1.3
Lh	Hydraulic based Loading Rate (in/month)	
U	Nitrogen Uptake Rate (lb/acre year).....	50.0
Ln	Nitrogen based Loading Rate (in/month)	
Cp	Limiting Percolate Nitrogen Conc. (mg/l).....	5.0
Cn	Applied Wastewater Nitrogen Conc. (mg/l).....	21.0
f	Fraction of Applied Nitrogen Removed by Denitrification and Volitilization.....	0.2
Ld	Design Wastewater Loading (in/month)	

CALCULATIONS: (EPA 625/1-81-013 Land Treatment of Mun. Wastewater)

Pw is based on 4% of measured permiability (Pm)

$$Lh = ET - Pr + Pw$$

$$Ln = \frac{(Cp)\ (Pr - ET) + (U)\ (10)}{(1 - f)\ (Cn) - Cp}$$

U monthly values are distributed in same proportion as ET

Month	Pr in/mo	ET in/mo	Net ET in/mo	Pw in/mo	Lh in/mo	U lb/acmo	Ln in/mo	Ld in/mo
JAN	4.1	-0.3	-4.4	0.0	0.0	-0.7	1.4	0.0
FEB	4.2	-0.1	-4.3	0.0	0.0	-0.3	1.6	0.0
MAR	5.2	0.5	-4.6	15.4	10.7	1.4	2.3	2.3
APR	4.3	1.6	-2.8	30.7	28.0	4.2	2.5	2.5
MAY	5.0	2.4	-2.7	39.7	37.0	6.4	3.2	3.2
JUN	5.4	3.1	-2.4	38.4	36.0	8.2	3.7	3.7
JUL	5.8	3.4	-2.4	39.7	37.3	9.1	4.0	4.0
AUG	5.0	3.3	-1.8	39.7	37.9	8.8	3.7	3.7
SEP	4.6	2.7	-2.0	38.4	36.5	7.1	3.2	3.2
OCT	3.6	1.7	-1.9	32.0	30.1	4.6	2.3	2.3
NOV	3.6	0.7	-2.9	16.6	13.7	1.8	1.8	1.8
DEC	4.3	-0.2	-4.5	0.0	0.0	-0.5	1.6	0.0
ANNUAL	55.1	18.7	-36.4	290.6	267.3	50.0	31.3	26.8

If the average daily flow is..... 0.0236 M.G.D.
the required application area is: 11.9 acres
and the resulting TOTAL NITROGEN loading is: 127.2 lb/ac yr

Attachment F

Soil Monitoring

- Soil Series Information
- Soil Maps
- Soil Monitoring Data

Soil Unit #1: Bailegap Series

The soils of this unit are deep to moderately deep and well drained. They have developed from colluvium derived primarily from hematite sandstones. Soil colors are predominantly dark red to reddish-brown and soil textures are predominantly loam in the upper 20 to 30 inches with clay loam predominating below 30 inches. Fragment content ranges from 10 to 15 percent to more than 70 percent.

Permeability of the upper loam horizon is moderately rapid because of strong structural development and a high organic matter content. The permeability of the subsoil horizon is moderate primarily because of moderate to strong structural development.

A concept of soil profile characteristics is available by reading soil profiles 104 through 112 in Mathews report.

The soils of this unit are well suited for use as a spray irrigation site because of good permeability and the capability to infiltrate water at a rapid rate. They occur on slopes ranging from about 6 percent to slopes in the order of 20 to 25 percent. Depth to rock ranges from about three feet to more than six feet. Their good water movement characteristics are illustrated by the absence of chroma 2 mottling and the presence of red to dark red colors and strongly developed structural characteristics. It is recommended that spray irrigation rates in the order of 30 acre-inches per year be considered for these soils. The 30 acre-inch per year recommendation is based on the fact that the soils occur on sloping sites and that some soil profiles show rock at a depth of about three feet.

Soil Unit #2: Lily Series

The soils of this site are deep to moderately deep and well to moderately well drained. They are developed from a thin veneer of dark reddish-brown soil materials associated with hematite sandstones which are underlined by soils developed from thinly bedded sandstones and shales of the Juniata Formation. The upper soil profile is loamy and has good infiltration characteristics similar to those of Unit #1. The subsoils have developed from weathered sandstones and shales and contain higher clay contents and are somewhat less permeable than those of Unit #1. Soil colors in the topsoil horizons are dark brown to dark reddish-brown and black with good permeability. Subsoil colors range from dark reddish-brown to yellowish-red, strong brown, yellowish-brown and sometimes contain gray and white mottles at depths ranging from about 30 to 48 inches below the soil surface.

Permeability of the upper soil profile is moderately rapid and for the subsoil horizons is moderate to moderately slow. Representative soil profile descriptions can be evaluated by looking at descriptions numbered 160 through 172 in Mathews report.

The soils of this unit are moderate to fair for use as spray irrigation sites. They are limited by occupying sloping positions which range from about 3 percent to slightly more than 20 percent. Depth to bedrock ranges from 36 to 60 inches and permeability of the slowest horizon is in the order of 1/8 inch per hour.

It is suggested that this area be utilized as a reserve irrigation site with a maximum application rate in the order of 20 to 24 acre-inches per year.

Soil Unit #3: Lily Series (Interbedded Shale near surface)

The USDA-SCS Soil Survey mentions that both Bailegap and Lily soil series will contain interbedded shale. It appears that this unit is similar to the previous unit, but the shale layer is closer to the surface.

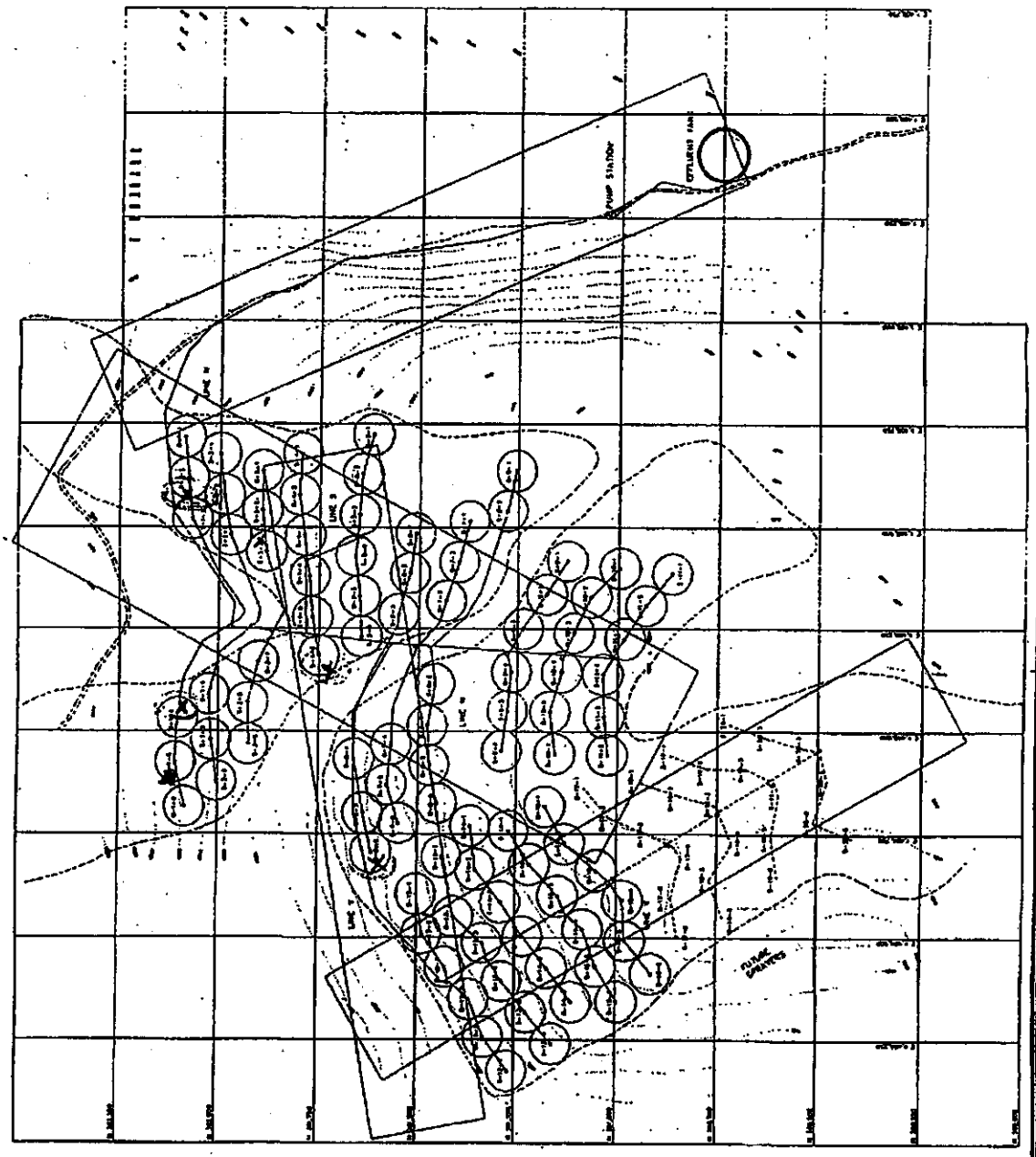
The soils of this unit have developed from a thin veneer of dark reddish-brown colluvial material associated with hematite sandstone which is underlain by clayey soils developed from stratified shale and sandstone of the Juniata Formation. The soils occupy gently rolling topography and have developed heavy clay subsoils. Gray mottles present are indicative of seasonal perched water tables which occur at depths ranging from 20 to 42 inches below the soil surface. These soils are not recommended for use as spray irrigation sites. The soils of this unit can be

Soil symbol	*Soil series, textural phase and slope class*	*Depth to seasonal high water table*	*Depth to bedrock*	*Estimated productivity group (for the proposed crop rotation).**	*Estimated infiltration rate (surface soil)*	*Estimated permeability of most restrictive subsoil layer*
27C	Lily-Bailegap complex; very stony; Lily: sandy loam; Bailegap: loam; 2 to 15 % slopes	> 6.0 ft.	Lily:20-40 in. Bailegap:40-60 in.	Lily: 4o Bailegap: 3o	0.15 – 0.30 in./hr.	Lily: 0.6 – 6.0 in./hr. Bailegap: 0.6 – 2.0 in./hr.
27E	Lily-Bailegap complex; very stony; Lily: sandy loam; Bailegap: loam; 15 to 35 % slopes	> 6.0 ft.	Lily:20-40 in. Bailegap:40-60 in.	Lily (North asp.): 4r Lily (South asp.): 5r Bailegap (North asp.): 3r Bailegap (South asp.): 4r	0.15 – 0.30 in./hr.	Lily: 0.6 – 6.0 in./hr. Bailegap: 0.6 – 2.0 in./hr.

*Productivity group represents the Woodland Management and Productivity Ordination Symbol, where the numbers represent potential productivity (1: very high; 2: high; 3: moderately high; 4: moderate; 5: low) and letters represent limitations (o: insignificant limitations; r: steep slopes.)

Attachment V-4 System Layout

X-Soil Sampling Areas

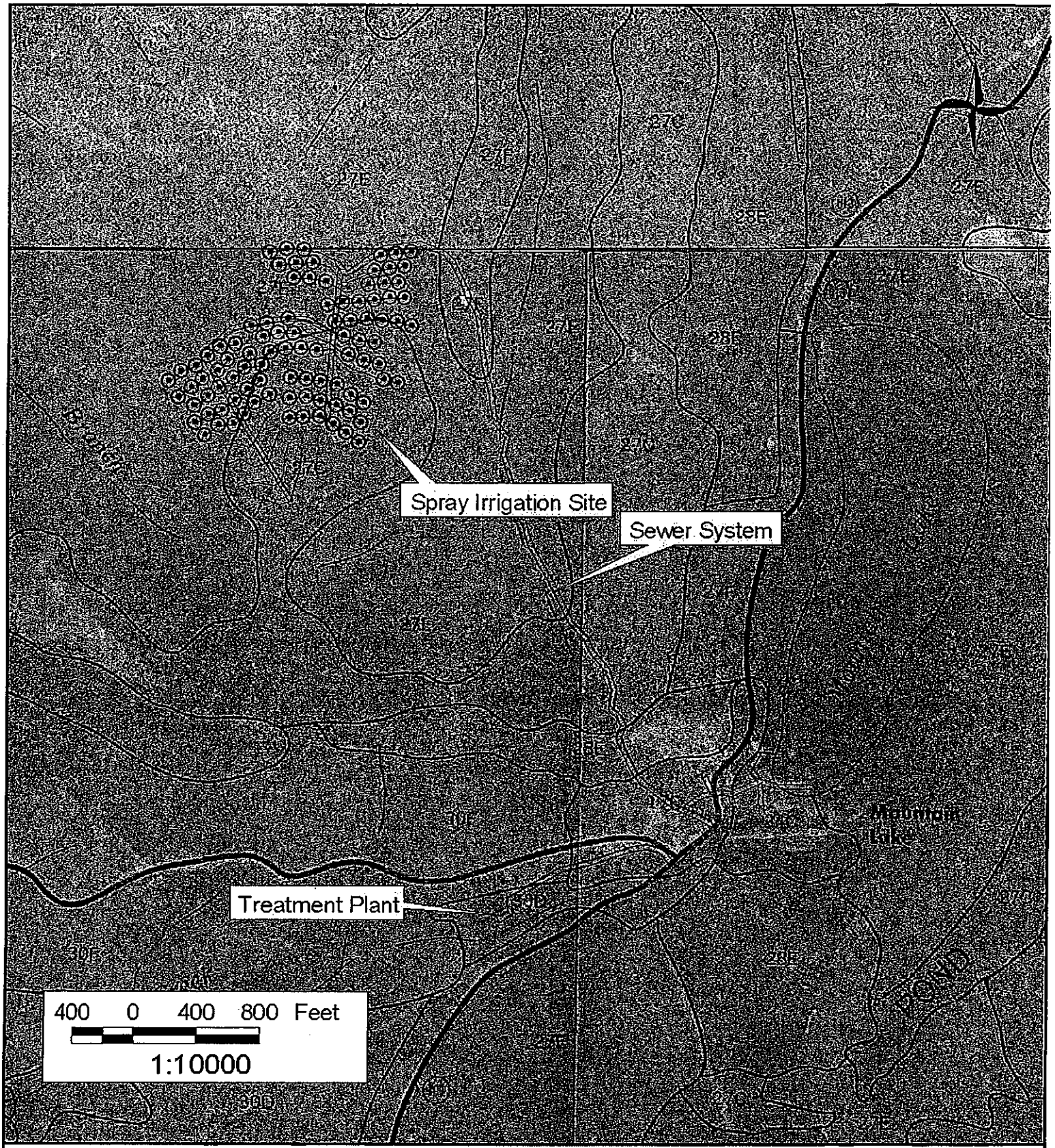


SPRAY IRRIGATION SYSTEM
SYSTEM LAYOUT

LAKE HOTEL
GLEN COUNTY, VIRGINIA
UTILITIES IMPROVEMENTS

ANDERSON AND ASSOCIATES, Inc.
Engineers
Surveyors
Planners
Blacksburg, Virginia

Attachment V-4 - 1



USDA-SCS Soil Survey Map
Mountain Lake, Virginia

ANDERSON & ASSOCIATES, INC.
Professional Design Services
www.andassoc.com
Virginia - North Carolina - Tennessee
100 Ardmore St.
Blacksburg, VA 24060
540-552-5592

MOUNTAIN LAKE

Mountain Lake Hotel (VPA2058)

Soil Monitoring (Subsite 1,2,3,4)

	4/26/2006		5/25/2005	
Parameter	**0-6 inches**	**6-12 inches**	**0-6 inches**	**6-12 inches**
soil organic matter (%)	2.1	2.1	2.8	4.5
soil pH (S.U.)	5.9	6.0	6.3	4.7
total N (ppm)	1000	1300	1400	2200
Organic N (ppm)	998	1300	1398	2192
Available P (ppm)	68.0	28.0	15	22
Exchangeable K (ppm)	121	126	16000	17000
Exchangeable Na (mg/100g)	900	1000	400	400
Exchangeable Ca (mg/100g)	59000	59100	67700	13100
Exchangeable Mg (mg/100g)	18100	6.4	19800	7200
Cation Exchange Capacity (meg/100g)	6.4	6.3	8.9	8.0

Attachment G

Public Notice

PUBLIC NOTICE – Environmental Permit

PURPOSE OF NOTICE: To seek public comment on a proposed permit from the Department of Environmental Quality that will allow the land application of treated municipal waste from a wastewater treatment system serving Mountain Lake Hotel in Giles County.
PUBLIC COMMENT PERIOD: April 19, 2012 through 4:30 pm of May 18, 2012
PERMIT NAME: Virginia Pollutant Abatement Permit – Wastewater issued by DEQ, under the authority of the State Water Control Board
APPLICANT NAME, ADDRESS, AND PERMIT NUMBER: Mary Moody Northen Endowment, 2628 Broadway Street, Galveston, Texas 77550, VPA02058
NAME AND ADDRESS OF PERMITTED ACTIVITY: Mountain Lake Hotel WWTP, 115 Hotel Circle, Pembroke, VA 24136
PROJECT DESCRIPTION: Mary Moody Northen Endowment has applied for a reissuance of a permit for the management of pollutants from a wastewater treatment facility. The permit will allow the applicant to store and apply treated municipal waste to 16 acres of forest land at a controlled rate. The permit contains soil and ground water monitoring.
HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by e-mail, fax, or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester. A request for a public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requestor, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if a public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit
CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS, AND ADDITIONAL INFORMATION:
NAME: Becky L. France; ADDRESS: Virginia Department of Environmental Quality, Blue Ridge Regional Office, 3019 Peters Creek Road, Roanoke, VA 24019-2738; PHONE: (540) 562-6700; E-MAIL ADDRESS: becky.france@deq.virginia.gov; FAX: (540) 562-6725. The public may review the draft permit and application at the DEQ office named above by appointment or may request copies of the documents from the contact person listed above.